



Third International Workshop on GFRP Bars for Concrete Structures (IW-GFRPCS-3)

Workshop Theme: “Advances in concrete reinforcement”

Date: August 3-4th, 2021

Location: Delta Hotel by Marriott Sherbrooke
2685 King Ouest
Sherbrooke, QC, Canada, J1L 1C1
Ph. (819) 822-1989

in conjunction with the 8th International Conference on Advanced Composite Materials in Bridges and Structures (ACMBS-VIII) (5 – 7 August 2021)

Organizers:

- **Chair: Brahim Benmokrane**, Tier-1 Canada Research Chair and NSERC/Industry Research Chair Professor, Director CRUSMAC, Department of Civil & Building Engineering, University of Sherbrooke, QC, CANADA
- **Co-Chair: Antonio Nanni**, Inaugural Senior Scholar Professor and Chair Dept. of Civil, Arch. & Environ. Engineering, University of Miami, FL, USA
- **Co-Chair: Steven Nolan**, Senior Structures Design Engineer, FDOT Structures Design Office, Tallahassee, FL, USA

Goal of Workshop: *Defining a path to broadly implement FRP bar for safe, economical and resilient concrete structures. Non-corrosive FRP rebars are an effective alternative to steel-reinforced concrete, with a market estimated at \$600M (2017). This workshop is geared for stakeholders involved in concrete construction, including owners, manufactures, installers, distributors, engineers, architects, and provinces, state, and city/local officials. The workshop aims to define a path to fully implement FRP bar for concrete structures.*

AGENDA

Monday, August 3rd - Education & Outreach

Welcome Remarks: 1:00 - 1:15 pm: Introduction of topics and attendees

Preamble: Conduct a facilitated exercise, composed of asking questions around “*Challenges to rebar market entry*” that will result in an initial set of WORD CLOUDS. The idea is to collect attendee’s impressions visually of the FRP rebar industry and practice. These will be divided to develop questions related to the different areas of the workshop (Education, Outreach and Advancement).

Session 1: Owner’s Perspective on the Use of GFRP Bars (1:15 - 3:00 pm)

Presentation 1-1 (2 @ 10 mins)

Discussion 1-1 (30 mins)

Presentation 1-2 (2 @ 10 mins)



Discussion 1-2 (30 mins)

Topics of Interest:

- a. Accelerated (Bridge) Construction advantages with FRP – Durability is not a concern; is coupling a challenge that needs solving?*
- b. LCC/LCA for justification of GFRP use*
- c. What are the primary drivers for DOT's & other owners to fully implement GFRP rebar?*
- d. In projects where GFRP is not specified, how would an owner make decisions about comparing these solutions with conventional materials (e.g., steel reinforcement)*
- e. 'Toolkit' for owners when deciding to specify or select GFRP over other non-corrosive reinforcements*

Refreshment Break and Icebreaker – Distribute Post-it notes for Q&A

Session 2: GFRP Bar Manufacturer's Installer's & Supplier's Perspective (3:20 - 5:20 pm)

Presentation 2-1 (2 @ 10 mins)

Discussion 2-1 (40 mins)

Presentation 2-2 (2 @ 10 mins)

Discussion 2-2 (40 mins)

Topics of Interest:

- a. Distribution model for bent bars and custom lengths – manufacturer versus fabricator*
- b. Uniform bar surface enhancement and bond properties*
- c. Bar bend quality/appearance*
- d. Methods of estimating for projects with GFRP rebar (rule of thumb, inclusion in DOT cost estimate tables)*
- e. Cost estimation – development of estimation tools*

Social Reception 5:30 – 6:30 pm (Delta Hotel by Marriott Sherbrooke)

Dinner & Free Discussion 7:00 to 10:00 pm (Delta Hotel by Marriott Sherbrooke)

Key Note Address: Opportunities for GFRP with TBM Tunneling (preliminary)

At this time, the cost of meals is not being provided, but participants are highly encouraged to attend to network and discuss related issues in a relaxed environment at a moderately priced restaurant in the hotel. Organizers are actively seeking industry support to defray the cost of meals.

Tuesday, August 4th – Advancement of GFRP-RC

8.00 – 8.15 am: Lessons learned from day one and short summary. Review Word Clouds, add/generate new ones (10 mins)

Session 3: Codes, Standards & Specifications Perspective on the use of GFRP Bars (8:15 - 10:00 am)

Presentation 3-1 (2 @ 10 mins)

Discussion 2-1 (30 mins)

Presentation 3-2 (2 @ 10 mins)

Discussion 2-2 (30 mins)

Topics of Interest:

- a. ASTM D7957 Specifications gaps:*
 - Stiffness minimum value;*



- Mechanical durability: fatigue (bar and bond) and creep;
- Chemical durability: strength, durability of bond;
- Inclusion of other resins and fibers.
- b. UV degradation on-site (storage and phased construction) – is it really a problem?
- c. ‘Toolkit’ for DOTs/owners to adopt GFRP-RC
- d. QC standardization by manufacturers:
 - What is critical to measure during production?
 - What internal QC tests are needed, is there a need to specify and standardize?
 - Lot testing turn-around time?
 - How to ‘protect’ industry from defective bars (both immediate properties as well as durability) can’t tell apart?

Refreshment Break

Session 4: Ongoing Research and New Applications (10:20 - 12:00 pm)

Presentation 4-1 (2 @ 10 mins)

Discussion 4-1 (30 mins)

Presentation 4-2 (2 @ 10 mins)

Discussion 4-2 (30 mins)

Topics of Interest:

- a. Resiliency of new structure designs considering functionality after major events.
- b. Bespoke Reinforcing
- c. Creep rupture and cyclic fatigue
- d. Concrete made from seawater/brine/contaminated aggregate: an opportunity for all stakeholders
- e. QC testing for manufacturers and laboratories

Closeout Session 5: Summary of Whitepaper (12:00 - 12:30 pm)

Summary of Whitepaper** from Sessions 1-4 (10 mins)

Discussion and Vote of Confidence (15 mins)

Closing Remarks (5 mins)

**** Scribes will be present at each session discussion to record issues of concern, agreement and needs raised by attendees for advancing the safe and economical deployment of GFRP reinforced concrete. These notes will be summarized at the conclusion for the preparation of a whitepaper. The whitepaper is expected to be completed by October 31st for distribution to the attendees as a record of the workshop and voluntary action plan preceding the 4th International Workshop in 2022/2023.**

Sponsors:

University of Sherbrooke

University of Miami

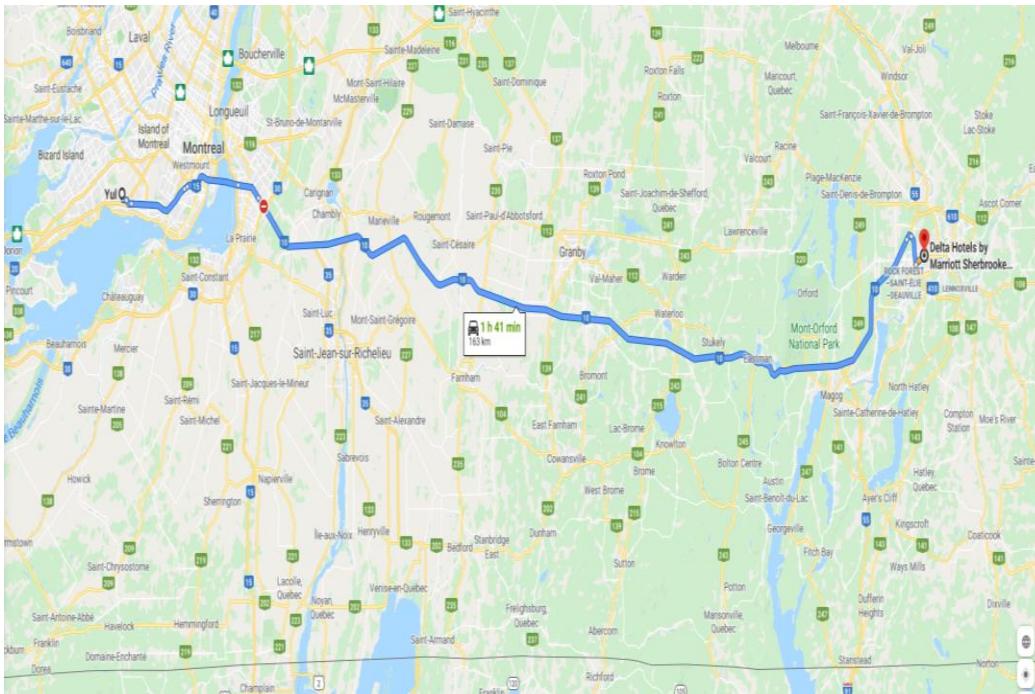
Ministry of Transportation of Quebec

The University of Sherbrooke Research Centre on FRP Composite Materials for Structures (CRUSMaC)

NSF I/U CRC Center for Integration of Composites into Infrastructure (CICI)

Natural Science and Engineering Research Council (NSERC) of Canada

Maps to Delta Hotel by Marriott Sherbrooke:



Google ©: [Map link from Montreal International Airport to Delta Hotel by Marriott Sherbrooke](#)



Topics for Project Case Studies on GFRP-RC/PC Structural Applications

1. Bridges - Superstructure
2. Bridges - Substructure
3. Concrete Pavement - CRCP
4. Buildings - Balconies
5. Buildings - Fire resistance
6. Magnetic sensitivity - Tolling & MRI structures, etc.
7. Stray current mitigation - Electrified rail & Utility structures.
8. Tunneling - Road, rail or transit
9. Tunneling - Water supply & wastewater
10. Retaining walls & Soil anchoring
11. Seawalls & Marine Structures

1,000-word maximum paper length. Papers will be curated and provided to workshop participants in PDF format prior to the workshop.

The organizers also recommended developing a two-page Fast-Facts sheet as an Attachment or alternative for any project case-study. See the following website for the suggested format of the Project Fast-Facts sheet: www.acmbs2020.ca

For more information, please do not hesitate to contact Professor Brahim Benmokrane

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