



B [UILD] SMART!

comfort, sicurezza, sostenibilità, innovazione

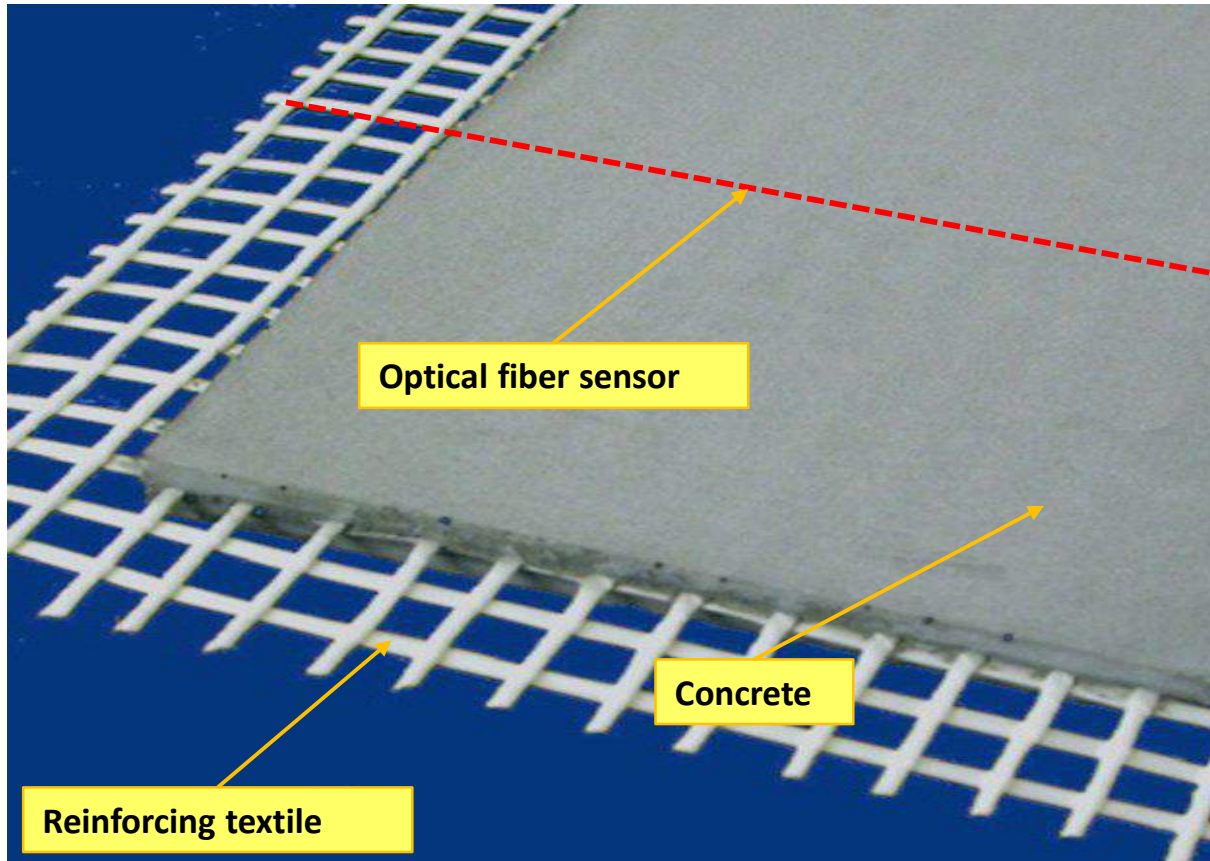
Paolo CORVAGLIA

Sviluppo di pannelli in calcestruzzo rinforzati con tessuto tecnico sensorizzato



Fiera Milano Rho, 13 | 16 marzo 2019

CONCEPT



Textile Reinforced Concrete (TRC)

- High corrosion resistance of non-metallic fibres
- Enhanced crack control
- Low self-weight of textile fabrics



High durability
Lightweight, thinwalled elements

Possibility to align the yarns in the direction of expected tensile stresses



Increase in effectiveness and load-carrying capacity

Textile formability



Complex freeform geometries

Textile sensorization



Structural monitoring capability



PILOT APPLICATIONS (not sensorized)



Footbridge in Oschatz, Saxony, Germany (2005)

Overall dimensions: 2.5 m in width × 8.6 m in span.

Components: 10 equal, 0.9 m long and only **3 cm thick** “U”-shaped units reinforced with textiles

Selfweight: 5 tons (5 times less in comparison to similar RC-bridge)

Bearing capacity: 3 times exceeded design values according to the German Codes

PILOT APPLICATIONS (not sensorized)

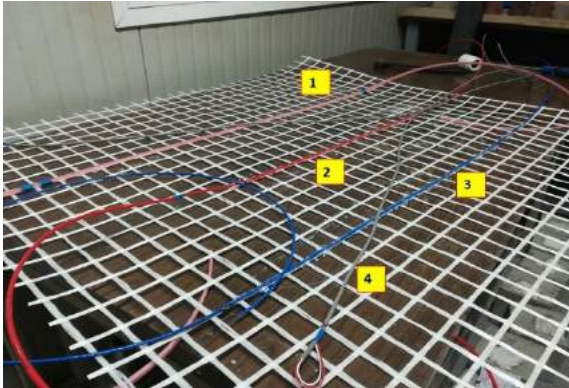


Ventilated facade of the Leiden Community College (2011)

10,000 m²
30 mm thick, textile-
reinforced concrete panels
0.6x1.8 m each



STEPS OF THE WORK



1) Design and development of the multifunctional reinforcing system



2) Integration of the multifunctional reinforcing system into the concrete component

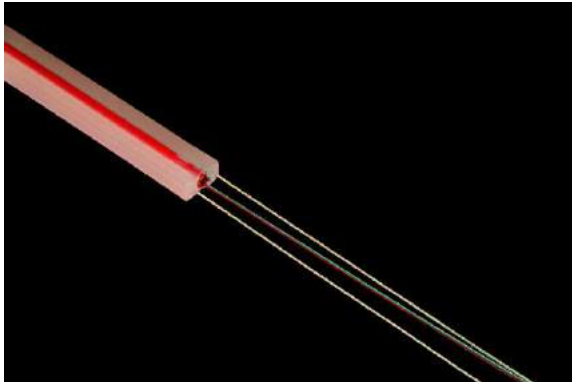
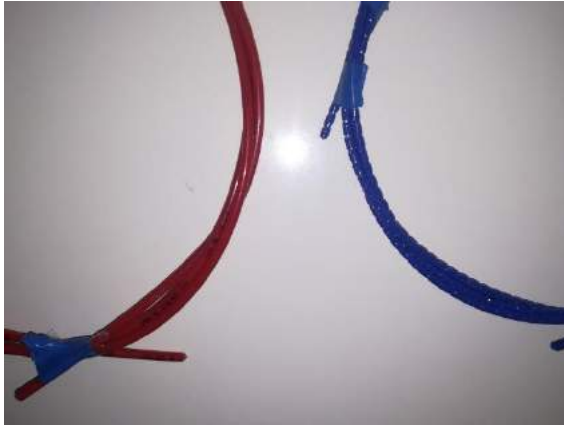
DESIGN AND DEVELOPMENT OF THE MULTIFUNCTIONAL REINFORCING SYSTEM



Textile specifications

- Fibers material: AR-glass
- Textile structure:
 - Leno woven fabrics, weft insertion warp-knitted
 - Mesh opening 3cm x 3cm
 - Polymeric coating

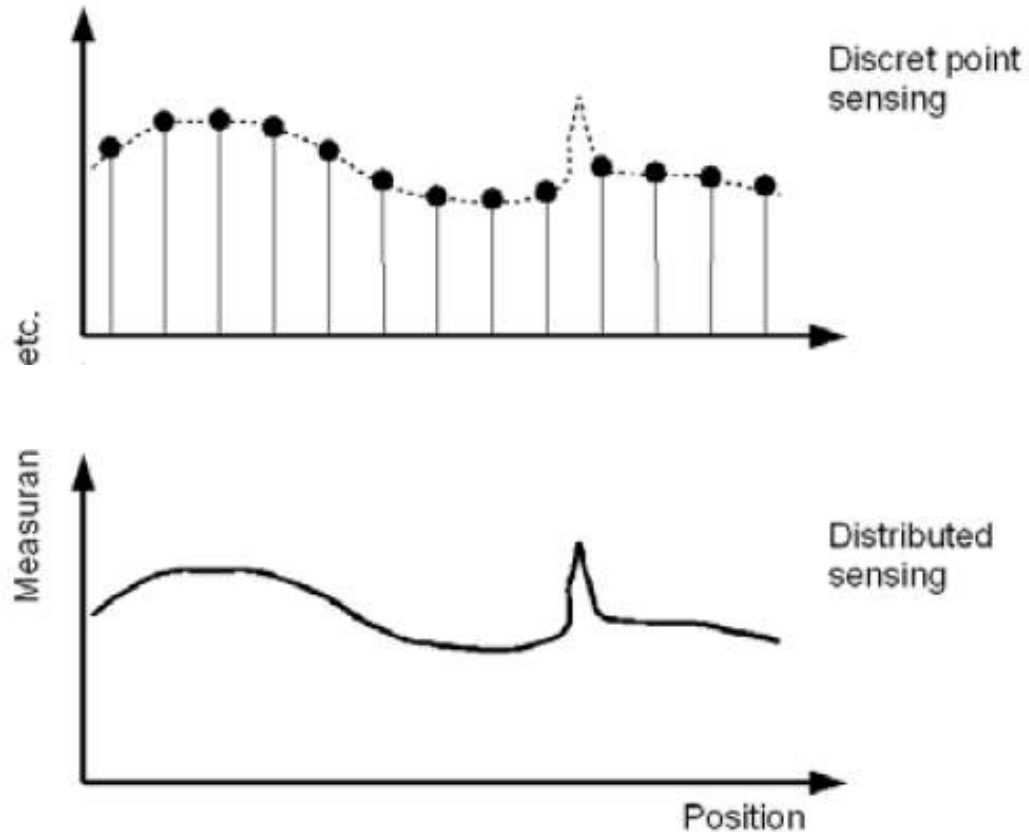
DESIGN AND DEVELOPMENT OF THE MULTIFUNCTIONAL REINFORCING SYSTEM



Sensors specifications

- Fiber Optics Sensor
- gage length: truly distributed
- working principle: Brillouin scattering
- metrological performances (accuracy, resolution, sensitivity, interrogation frequency),
- dimensions and robustness
- Thermal compensation

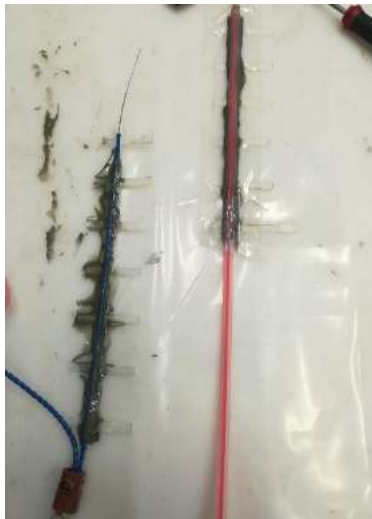
DESIGN AND DEVELOPMENT OF THE MULTIFUNCTIONAL REINFORCING SYSTEM



DESIGN AND DEVELOPMENT OF THE MULTIFUNCTIONAL REINFORCING SYSTEM



post-production stitching



post-production gluing

Integration strategies

~~Insertion during grid production
(unfeasible!)~~

INTEGRATION OF THE MULTIFUNCTIONAL REINFORCING SYSTEM INTO THE CONCRETE COMPONENT

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Sensors fixing

INTEGRATION OF THE MULTIFUNCTIONAL REINFORCING SYSTEM INTO THE CONCRETE COMPONENT



Sensor cables protection



INTEGRATION OF THE MULTIFUNCTIONAL REINFORCING SYSTEM INTO THE CONCRETE COMPONENT

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Mould preparation



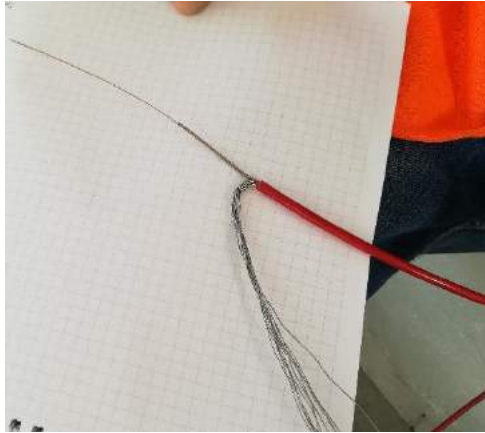
INTEGRATION OF THE MULTIFUNCTIONAL REINFORCING SYSTEM INTO THE CONCRETE COMPONENT



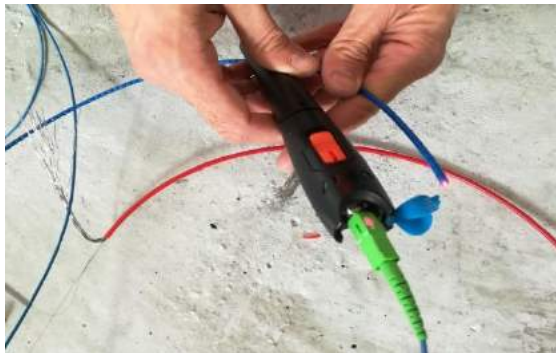
Concrete casting, vibration and demoulding



INTEGRATION OF THE MULTIFUNCTIONAL REINFORCING SYSTEM INTO THE CONCRETE COMPONENT



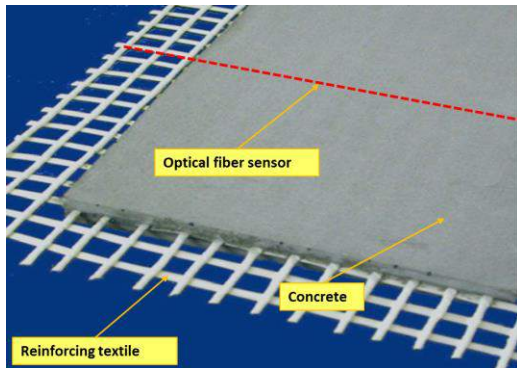
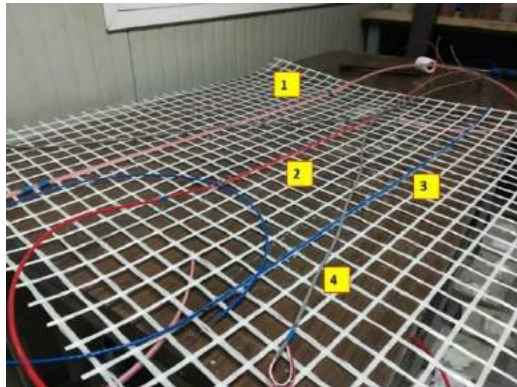
Sensors connection and testing



All connections successfully tested!



CONCLUSIONS AND NEXT STEPS



- ✓ Development of an innovative precast solution, based on the replacement of steel rebars with sensorized textile reinforcement
- ✓ High durability, lightweight, thinwalled elements
- ✓ Increase in effectiveness and load-carrying capacity
- ✓ Complex freeform geometries
- ✓ **Structural monitoring capability**

Next step: calibration testing

The ENDURCRETE Project, leading to the described application, has received funding from the EU's H2020 Programme, under G.A. n. 760639

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Padiglione 4

B[UILD] SMART! INVOLUCRO



Padiglione 10

B[UILD] SMART! COSTRUZIONI

GRAZIE PER L'ATTENZIONE

