

Infraction
An Infrastructure Innovation Programme

SEACON

Project duration: 30 mos.

Challenge F: Resource and energy efficiency in road construction and maintenance (Eco-design)

Challenge G: Virgin material reduction by substitution or recycling

Infraction kick off meeting
Brussels, 12-13 November 2015

Name: Federica Bertola
Organisation: Buzzi Unicem


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Buzzi Unicem


Buzzi Unicem is a multiregional company focused on cement and concrete.
Headquarter in Italy, R&D laboratories in Italy and Germany.



Country	Count
Italy	10.0
United States	9.9
Germany	7.2
Luxembourg	1.4
Poland	1.6
Czech Rep.	1.1
Russia	4.7
Ukraine	3.0
Mexico	6.3
Algeria	2.1
Slovenia	1.3

As of 31 December 2014

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Concept of SeaCon project


- More than half of the world's population will lack sufficient drinking water by 2025
- The construction industry uses several billion tons of freshwater annually to wash aggregates and mix/cure concrete
- The potential use of recycled raw materials (fuels, aggregates, SCMs) in cement and concrete production is limited by the chloride content

The use of seawater and salt- contaminated aggregates is prohibited by standards and codes due to associated risks of corrosion of steel reinforcement



ref.: <http://www.water.ca.gov/>

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Main goal of SeaCon project

The safe utilization of seawater and salt-contaminated aggregates (natural or recycled) for a sustainable concrete production when combined with non-corrosive reinforcement


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Objectives

- Make it clear that chlorides are harmful for steel reinforcement, but they do not damage the concrete's characteristics (i.e., workability, strength development, durability)
- Assess through LCA and LCC durability performances and economical impact resulting from use of chloride contaminated aggregates, high chloride content cement and seawater on structural concrete
- Work at reinforcement level (improved SSR bar and use of GFRP bar in concrete)
- Demonstrate technology by means of two real-size field prototypes in two countries (Italy and Florida, USA)



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Consortium / partners

Partners


- University of Miami (UM)
- ATP srl (ATP)
- Politecnico di Milano (POLIMI)
- Owens Corning (OC)
- Buzzi Unicem (BUZZI)
- Acciaierie Valbruna (AV)

Collaborators

- Florida Department of Transportation (FDOT)
- Pavimental (PV)
- Titan America (TT)

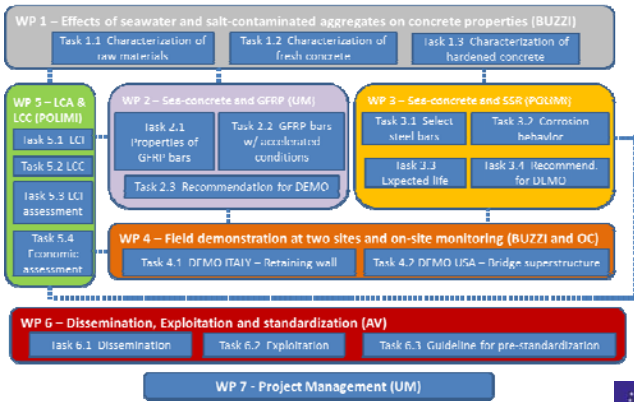


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WPs, Tasks and Their Relationships





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Work Package 1

- Production of cement with high chloride content (> 0.1%, i.e. out of EN 197-1 Standard!)
- Recovery of artificial aggregate with high chloride content
- Concrete mix-design optimization
- Characterization of hardened concrete

(M14)


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Work Package 2

Production and characterization at lab scale of concrete developed in WP 1 containing GFRP bars (made of boron-free E-CR glass fibers embedded in a vinyl ester resin)



Output: evaluation of expected life of GFRP bars embedded in chloride contaminated concrete and recommendation for demo projects


(M20)

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Work Package 3

Based on work in WP1, appropriate stainless steel bars (SSR) will be selected and characterized as reinforcement to concrete (according to the chloride limits determined by the initial contamination of raw materials and further expected penetration from the environment)



Output: evaluation of expected life of SSR bars embedded in chloride contaminated concrete and recommendation for demo projects

(M20)

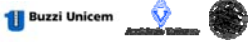
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Work Package 4

Field demonstration projects and their long-term on-site monitoring


- Reinforced concrete retaining wall in Italy



- Bridge substructure and superstructure in Florida (USA)



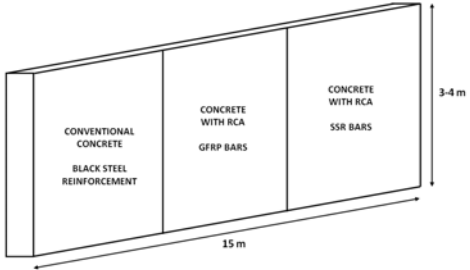
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WP4- Proposed Demo 1 - Rome, Italy

Project consists of a reinforced concrete retaining wall:



Wall is exposed to harsh environmental conditions (including artificial addition of chlorides), ideal challenge to longevity of the structure.


(M28)

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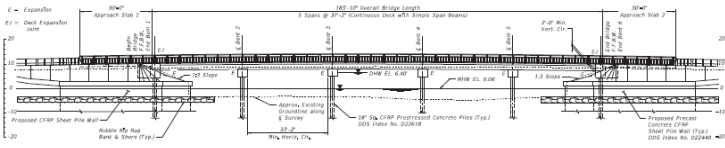
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WP4- Proposed Demo 2 - Tampa, FL


Replace functionally obsolete Halls River Bridge to increase capacity and improve safety.



New bridge total length is **56.5 m** consisting of five **11.3 m** simply supported spans (two 3.6-m traffic lanes with 2.4 m outside shoulders, 1.5-m wide sidewalk with standard traffic barrier and bridge pedestrian/bicycle railing on each side).



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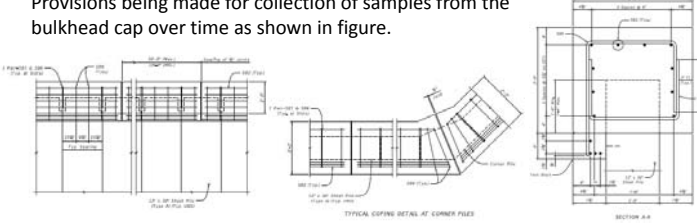


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WP4- Proposed Demo 2 - Tampa, FL

Super- and sub-structure classified as extremely aggressive due to chloride concentrations in water and close proximity of superstructure to water. Non-corrosive bars and stirrups address long-term durability of cast-in-place concrete bulkhead caps, pile caps, wing-walls, back-walls, deck, traffic barriers, and approach slabs.

Provisions being made for collection of samples from the bulkhead cap over time as shown in figure.




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Work Package 5

- LCA to calculate the environmental impact 
- LCC to do the economic optimization


Output: to ensure and prove feasibility and sustainability of SEACON-technology

- Alignment to R&D been conducted by LCE4ROADS (formerly ECOLABEL) EU project for:
 - materials
 - processes selection
 - design



(M30)

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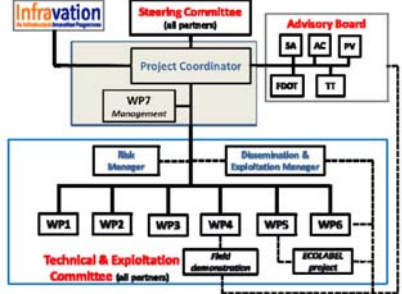


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Work Package 6 and Work Package 7


- Dissemination
- Exploitation
- Standardization

Management organization chart



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WP6 – Tech transfer activities

ACE Innovation Award Finalist
CAMX 2015 – The Composites and Advanced Materials
Expo, October 26-29, 2015, Dallas, TX

<https://vimeo.com/144433359>

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Main outcomes and deliverables

Material related:


- mix-design of chloride contaminated concrete
- know-how on performance (durability) of chloride containing cement and concrete
- know-how on expected service life of GFRP and SSR bars embedded in chloride contaminated concrete

Infrastructure related:

- Demo fields in Italy and USA (long-term monitoring)

Sustainability and economics related:

- LCA and LCC assessment
- Best practice and standardization needs for using SEACON technology in construction

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Main outcomes and deliverables

Dissemination related:

- conferences
- training for young researchers
- workshops

Social output related:

- jobs opportunities

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Thanks!

Questions?

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