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AT
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17-18 SEP 2024

17.09.2024

International best practice

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#OffsiteSummit | #CollaboratingForImpact

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17.09.2024 12:05 – 13:40 | Session 2

Global infrastructure: major projects driving innovation

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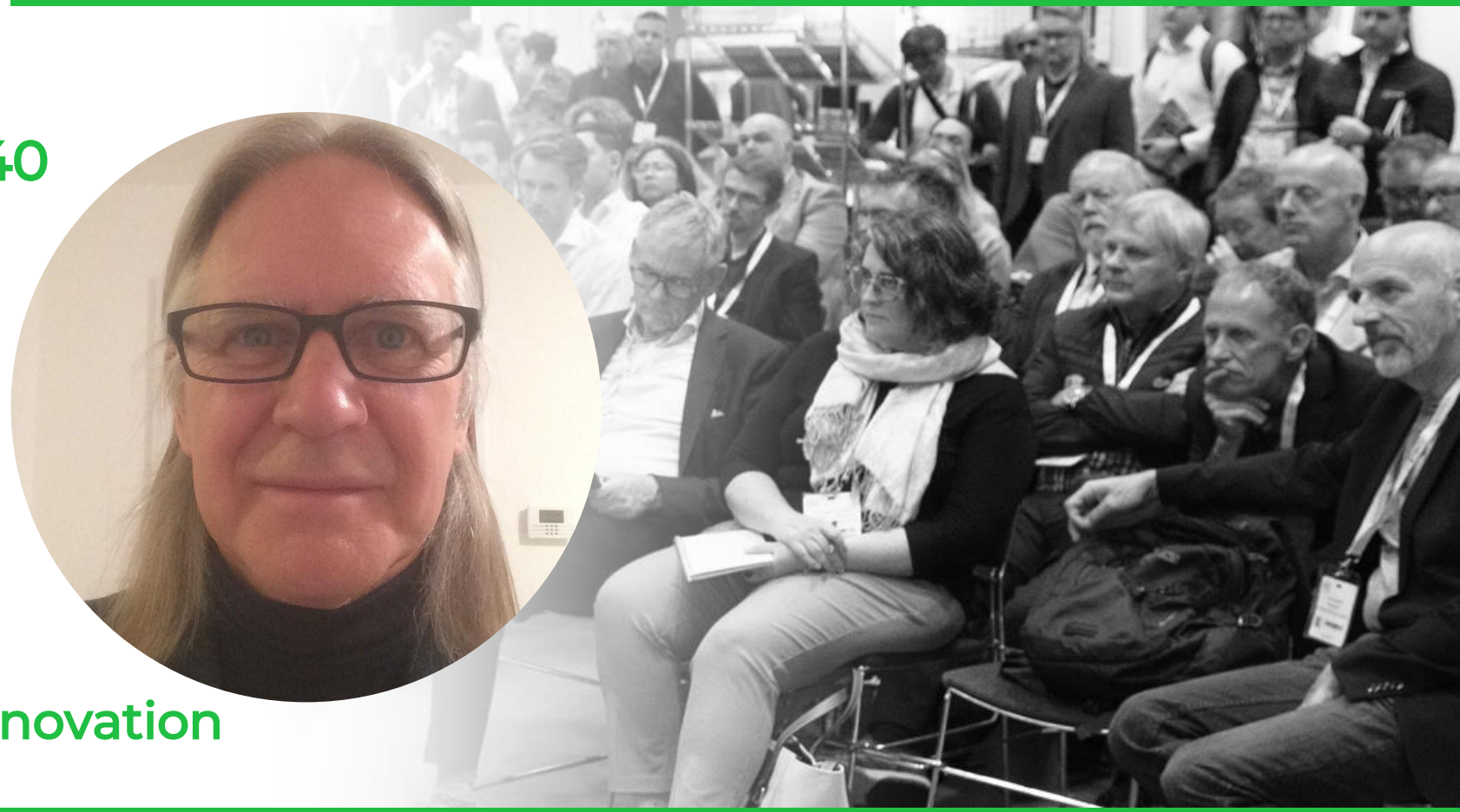

17.09.2024 12:05 – 13:40

Nigel Fraser

Industry Advisor
BUILDOFFSITE

Global infrastructure: major projects driving innovation

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#Digital | #Innovation

Celebrating 20 years of BUILDOFFSITE

Set up in 2004 as the voice of the industry, BUILDOFFSITE has sought to promote, support and increase the adoption of offsite and pre-manufactured solutions for the built environment.

“To be the trusted independent voice of the construction industry with respect to offsite and pre-manufacturing, and to provide all relevant support to our members and other stakeholders.”

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SCAN ME

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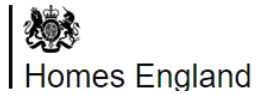
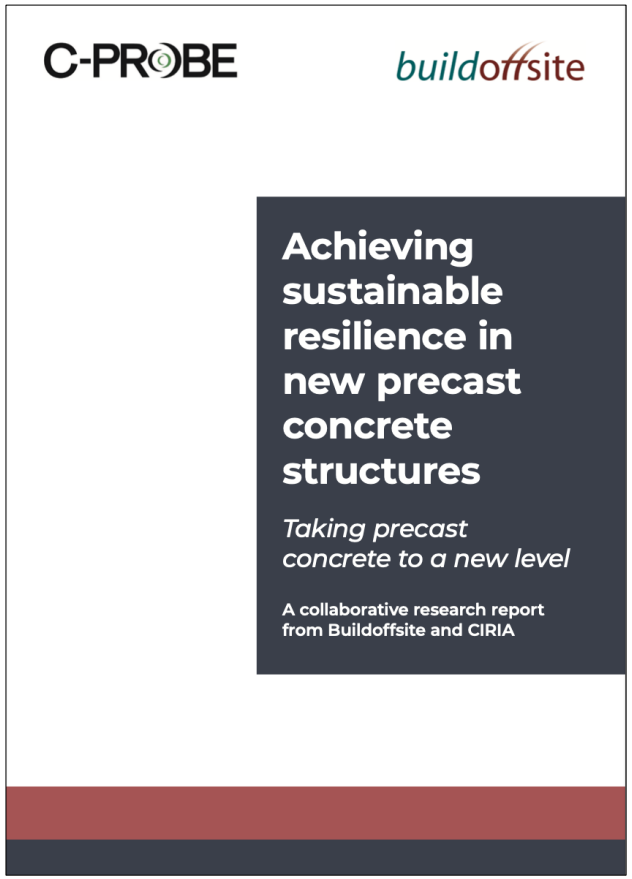
Networking | Events
Exhibition Seminars
Site visits | Advice & Guidance
Knowledge Sharing | Publications
Marketing & Promoting Members
Influencing

BUILDOFFSITE members



BUILDOFFSITE guidance 2022 – 2024



Client Group proposal approved for 2023 – 2024

Performance specifications guidance

Upcoming BUILDOFFSITE events

2-4 October

Structural Timber Awards 2024

13 November

DfMA for net zero carbon

20-21 November

London Build Expo

28 November

BOPAS Forum

4 December*

BOS Christmas members' meeting

Spring 2025*

Using performance specifications to facilitate the adoption of MMC – new BOS/CIRIA guidance

*Provisional date

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Global infrastructure: major projects driving innovation

Ignacio Navarro
Ferrovial Construction

Dr Xiaobin Zhao
AgriCycle Innovation

Guillaume Danis
Techno Metal Post

Jos Kronemeijer
Kronemeijer Concrete Consult

Dr Ali Fahad Al-Jawf
Omran Tech

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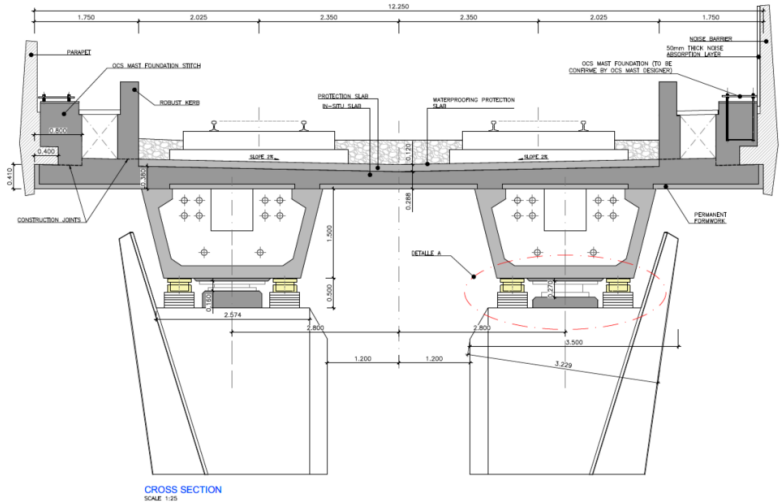
Ignacio Navarro

Engineering Director
UK & Ireland
Ferrovial Construction

Global infrastructure: major projects driving innovation

Thame Valley Viaduct – DfMA solution



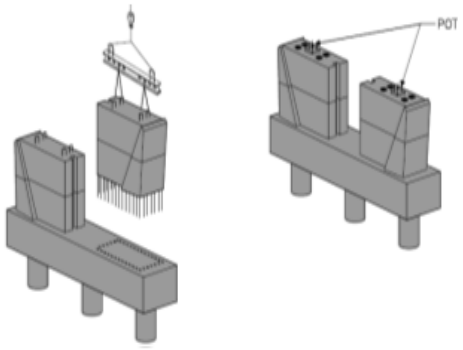
Length	Width	Spans
880 m	12.25 m	1x20m + 33x25m + 3x20m

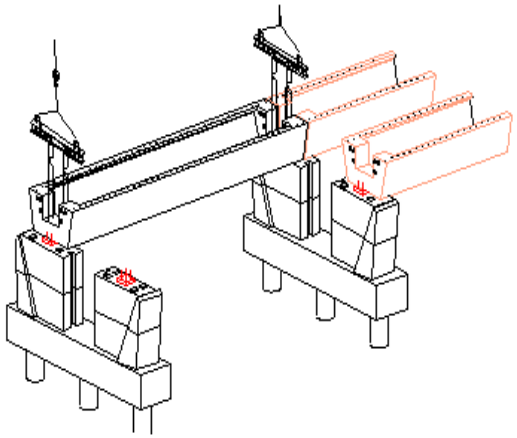
- 2 No. Precast Box Girders (vs 4 No. former solution)
- Continuous deck (connection with PT Bars above piers)
- RC Top Slab comprising Truss Type Precast Slabs + In situ Concrete
- Precast piers

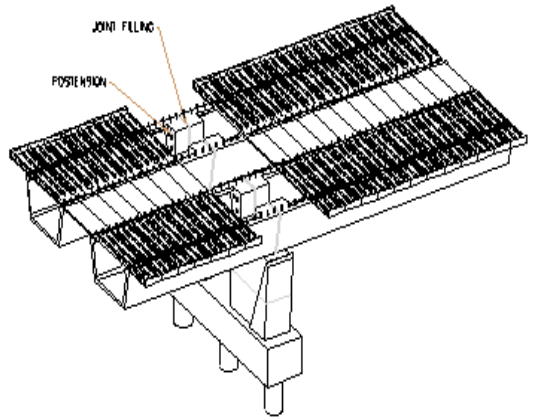
Thame Valley Viaduct – DfMA solution

ferrovial construction

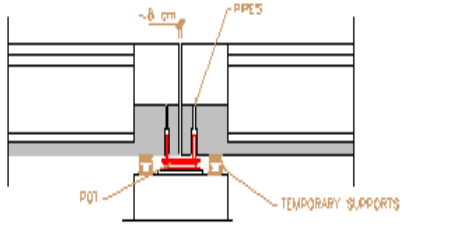
2 No. Precast Box Girders (vs 4 No. former solution)

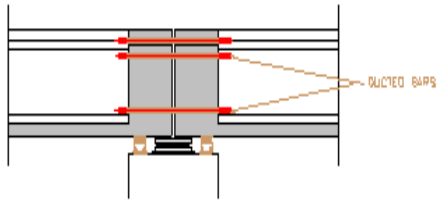




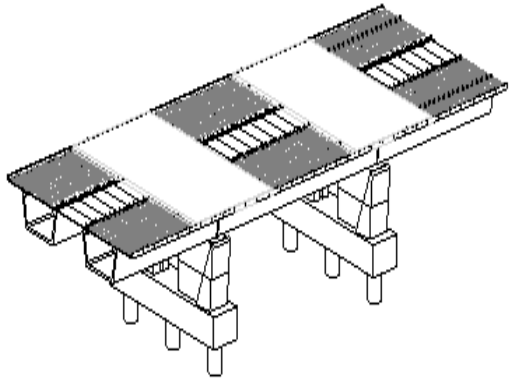


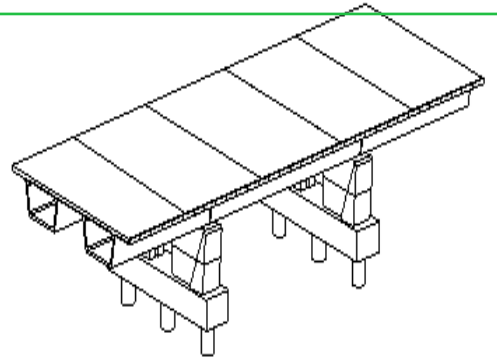
Continuous deck (connection with PT Bars above piers)





RC Top Slab Truss Precast Slabs + In situ Concrete



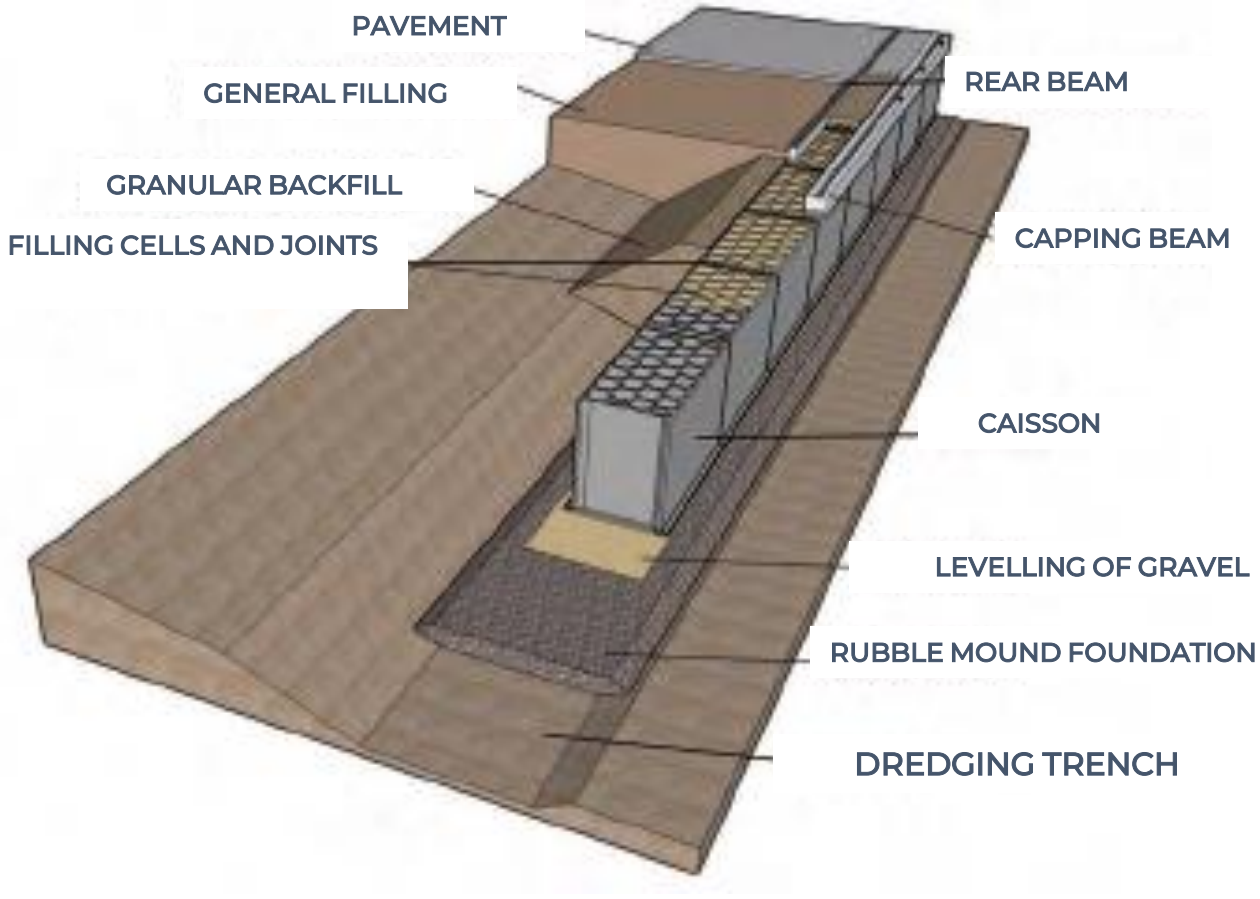


Key aspects to highlight

- ✓ More efficient structural solution
- ✓ Improved Health &, Safety in construction
- ✓ Delivery of a better-quality product
- ✓ Earlier completion / faster execution
- ✓ Reduction in the carbon footprint
- ✓ International collaboration + knowledge transfer

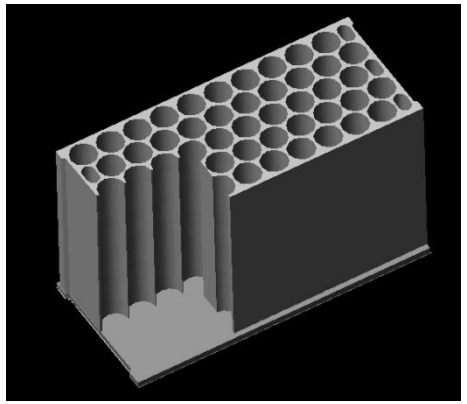
Quay of Caissons: offsite international case

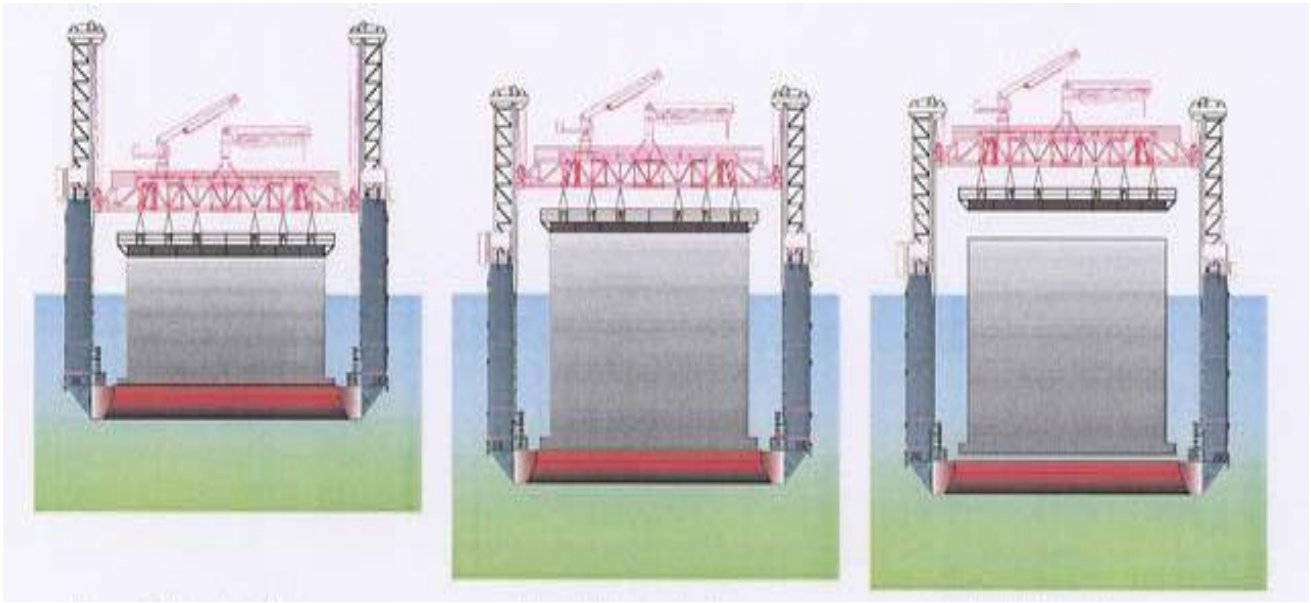
ferrovial construction



Quay of Caissons: description const. process

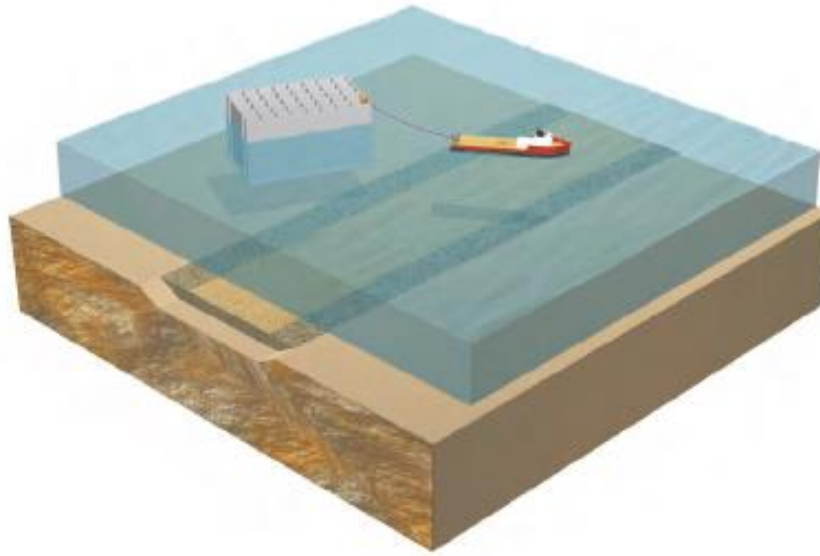
ferrovial construction





Quay of Caissons

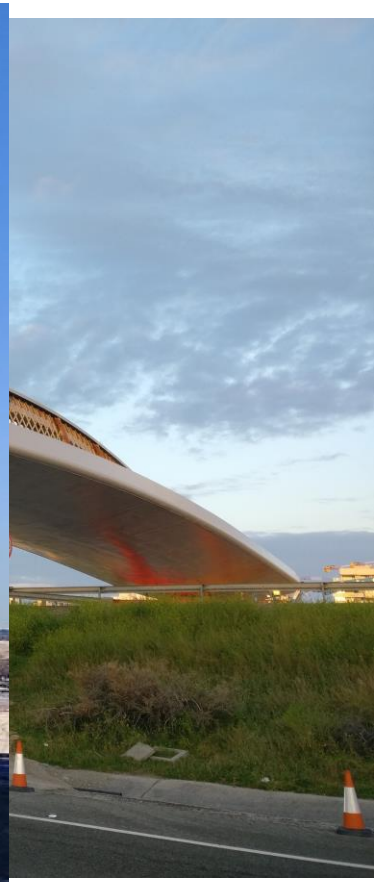
Construction and transport of caisson by towing to its final position



Other examples: Floating off-shore pilot DEMOSATH

Other examples: Floating off-shore pilot DEMOSATH

Other examples: ABC Puente Concordia



Thank You!

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Dr Ali Fahad Al-Jawf

Chief Executive Officer
Omran Tech

Global infrastructure: major projects driving innovation

LGS Construction: A Sustainable Solution for the Imam Turki Bin Abdullah Royal Nature Reserve

Presented by Dr. ALI FAHD AL-JOUF, CEO of OMRANTECH

Video

LGS Construction?

Benefits

LGS construction is a modern building method that uses light-gauge steel as the primary structural material.

It offers several advantages over traditional construction methods, including:

- Faster construction times
- Improved quality control
- Reduced costs
- Increased sustainability

Why LGS for the Imam Turki Bin Abdullah Royal Nature Reserve Project?

- The Imam Turki Bin Abdullah Royal Nature Reserve is a unique and valuable natural area.
- LGS construction was selected for this project due to its:
- Sustainability: LGS is a highly recyclable material, reducing the project's environmental impact.
- Efficiency: LGS construction can be completed more quickly than traditional methods, minimizing disruption to the natural environment.
- Adaptability: LGS can be easily customized to fit the specific needs of the project.

LGS Construction Approach

The LGS construction approach for the Imam Turki Bin Abdullah Royal Nature Reserve project involved:

Off-site fabrication: Components were prefabricated in a controlled factory environment, ensuring high quality and reducing on-site construction time.

Modular assembly: The prefabricated components were assembled on-site, like building blocks, further speeding up the construction process.

Sustainable materials: LGS is a highly recyclable material, reducing the project's carbon footprint.

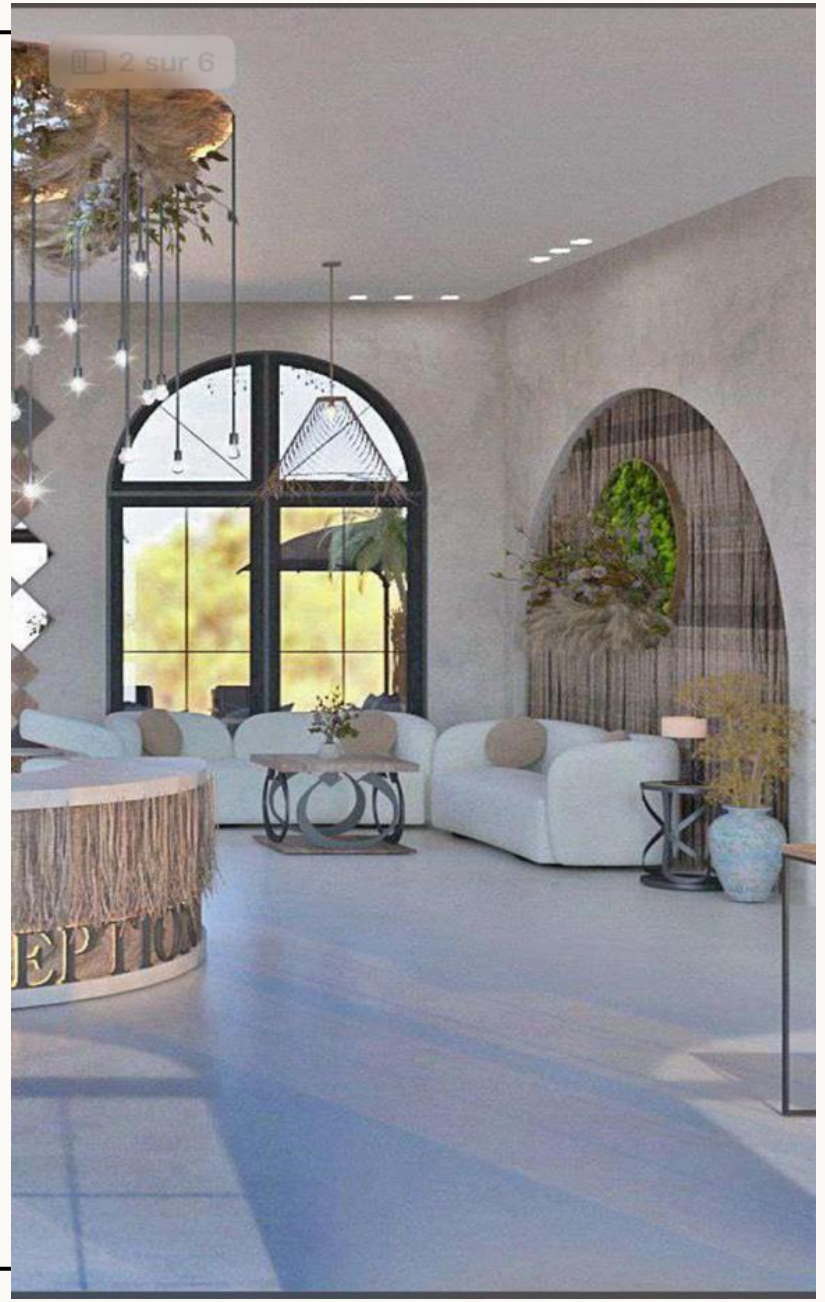
LGS Implementation and Advantages

The LGS construction approach resulted in several significant advantages, including:

Reduced construction time: The project was completed 50% faster than it would have been using traditional construction methods.

Lower material waste: LGS construction generates less waste than traditional methods, reducing the project's environmental impact.

Improved quality control: The off-site fabrication process ensures high-quality components and reduces the risk of errors on-site.



The Imam Turki Bin Abdullah Royal Nature Reserve project provides valuable lessons for future LGS construction projects, including:

Insights Gained and Their Relevance

Early stakeholder engagement: Involving stakeholders early in the process can help ensure a successful project.

Use of local suppliers: Supporting local businesses can strengthen the local economy and reduce the project's carbon footprint.

Potential for broader adoption: LGS construction can be applied to a wide range of projects, from residential buildings to commercial spaces.

International Collaboration and its importance

Together, we can build a sustainable future through collaboration and innovation!

Knowledge Transfer	Capacity Building
Innovative Solutions	Policy Alignment

Success story of International Collaboration with Omrantech and British Offsite in KSA

عمران تك
OMRAN TECH

Omran Tech Group

Our Services:

Architectural Design
Engineering Consultancy
Contracting Services

Technology Integration:

- Architectural Design
- Engineering Consultancy
- Contracting Services

Notable Projects

- Imam Turki bin Abdullah Royal Reserve
- Structural reinforcement for Saudi Electricity Company

- We are a leading provider of LGS construction solutions in Saudi Arabia.
- Our expertise in LGS construction allows us to deliver innovative, sustainable, and cost-effective projects.
- We are committed to providing exceptional service to our clients and contributing to the sustainable development of Saudi Arabia.

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Guillaume Danis

Dealer and Market Developer
Techno Metal Post

Global infrastructure: major projects driving innovation

Techno Metal Post
Innovative Ready to Build Foundation System to Support Global Infrastructure Projects

Techno Metal Post Foundation System

SIMPLER, QUICKER

EFFICIENT

LOW FOOTPRINT, SUSTAINABLE

BUILDING CODE COMPLIANT

Electrical substations

- **Quick installation** enabling continuous construction.
- **Precision of installation** to avoid rework
- Large-scale projects in **restricted environments**

Gas pipelines

- **Quick installation** enable continuous construction.
- **Dry process** with immediate use of foundation
- Foundations **non sensitive to soil movements**

Highway infrastructure

- Ability to operate **while traffic is ongoing**
- **10mm installation tolerance** for boardwalk modular units

Temporary modular units

- **Full adaptability** to modular construction
- **Reversibility** of helical pile foundations
- **Reusability** to minimise footprint

Hospital modular extension

- **Ready-to-build & certified** technology
- **Low** environmental & local **disturbances**
- **Weather independent** installation

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Dr Xiaobin Zhao

Managing Director
AgriCycle Innovation

Global infrastructure: major projects driving innovation

Global infrastructure: major projects driving innovation

Click here to view Dr Zhao's pre-recorded presentation

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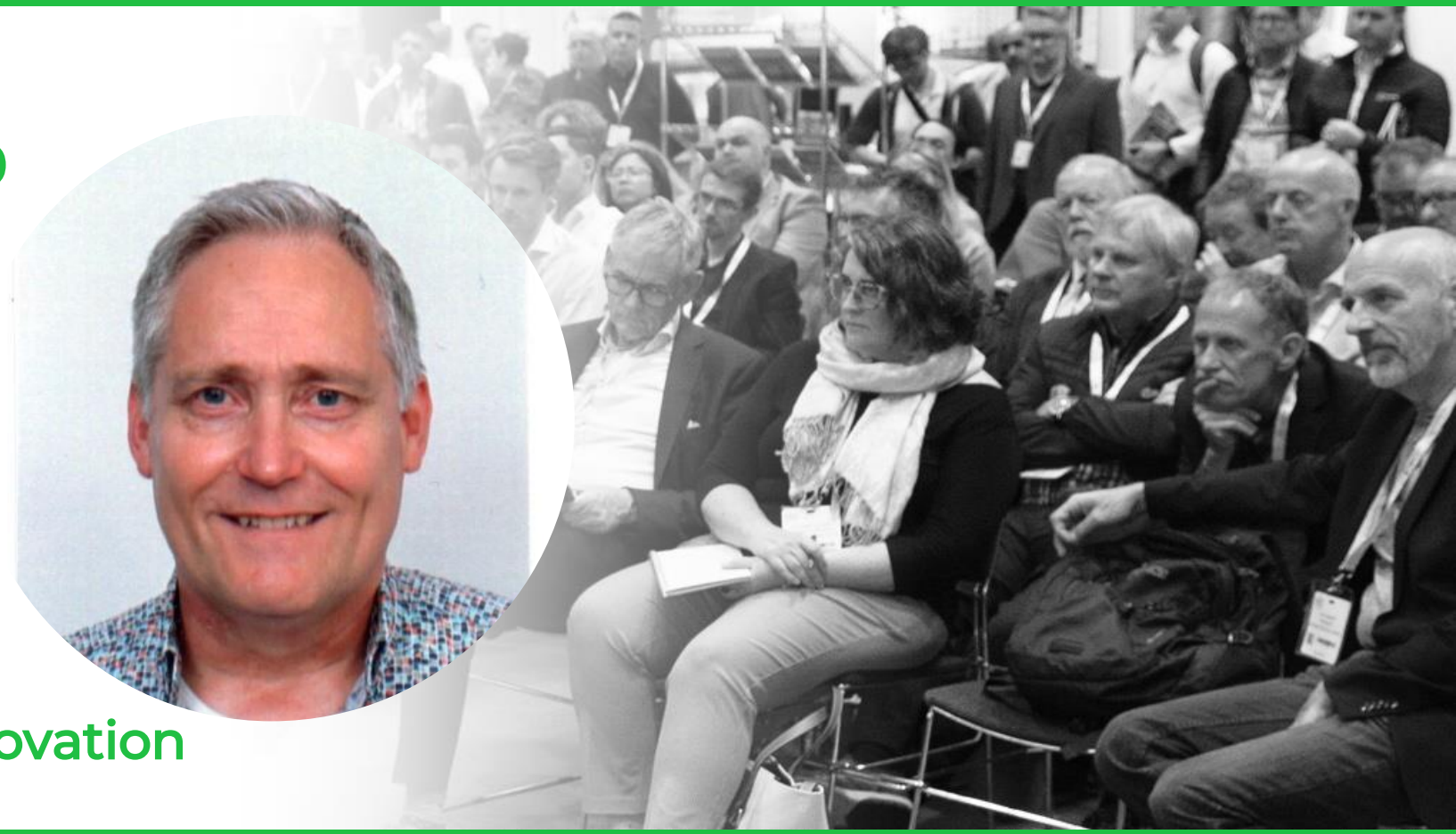

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Jos Kronemeijer

Senior Materials Technologist
Concrete and Cementitious Composites
Kronemeijer Concrete Consult

Global infrastructure: major projects driving innovation

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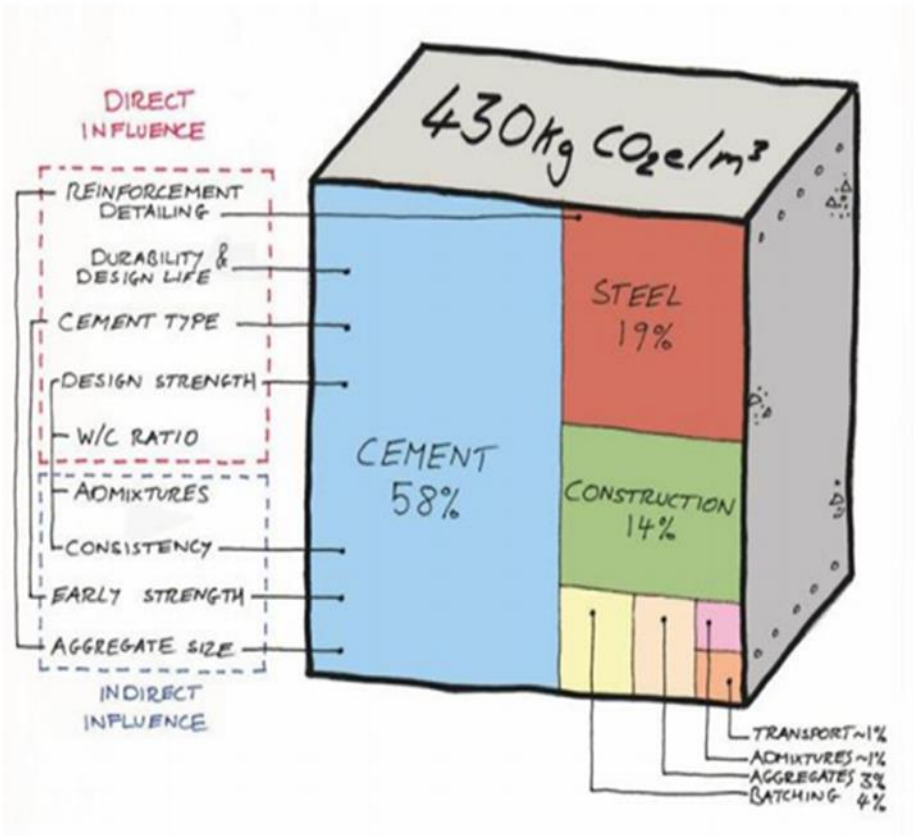
C-PROBE

LOW CARBON PRODUCTS & SERVICES FOR THE PRESERVATION OF THE BUILT ENVIRONMENT

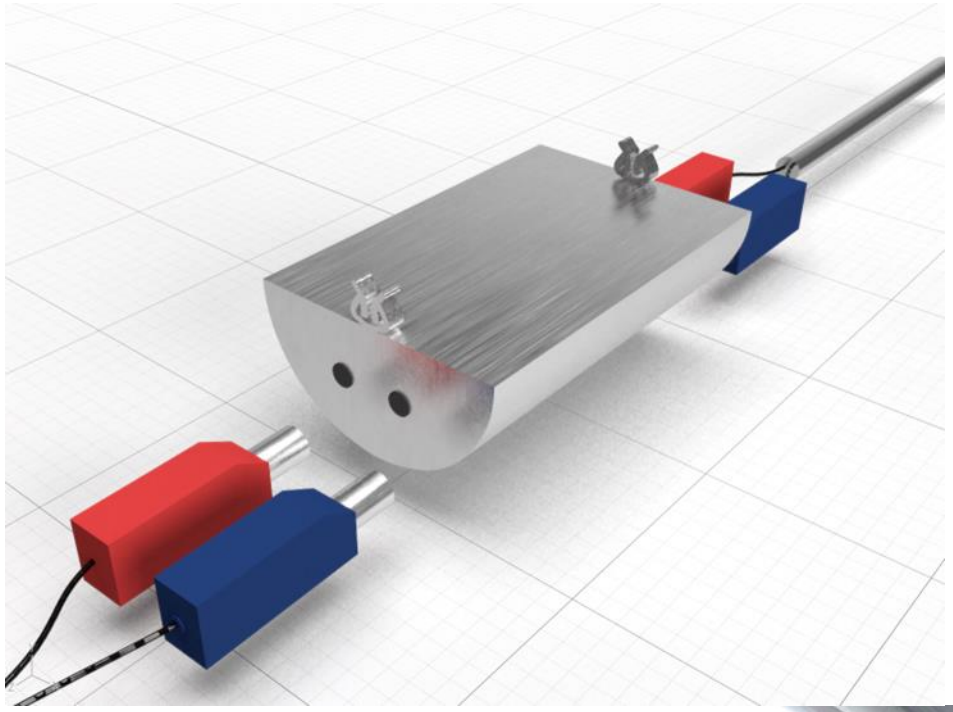
Embodied Carbon Savings – Case Study

Example for a reinforced concrete plaza deck project in New York City:

- Footprint of 40,000sqm with 18,500sqm being removed and replaced at a depth of 600mm
- **@348kg CO2e/ m3 (81% ex steel) = loss of 3.9kte CO2e due to the slow decision to treat early**
- However, **ICCP to 21,500sqm saves 5.5kte CO2e @430kg CO2e/ m3**
- Futureproofing 40,000sqm of Plaza decks with ICCP **means no further loss and preservation of 10.3kteCO2e.**
- Data and remote-control acts as assurance of performance to International standards



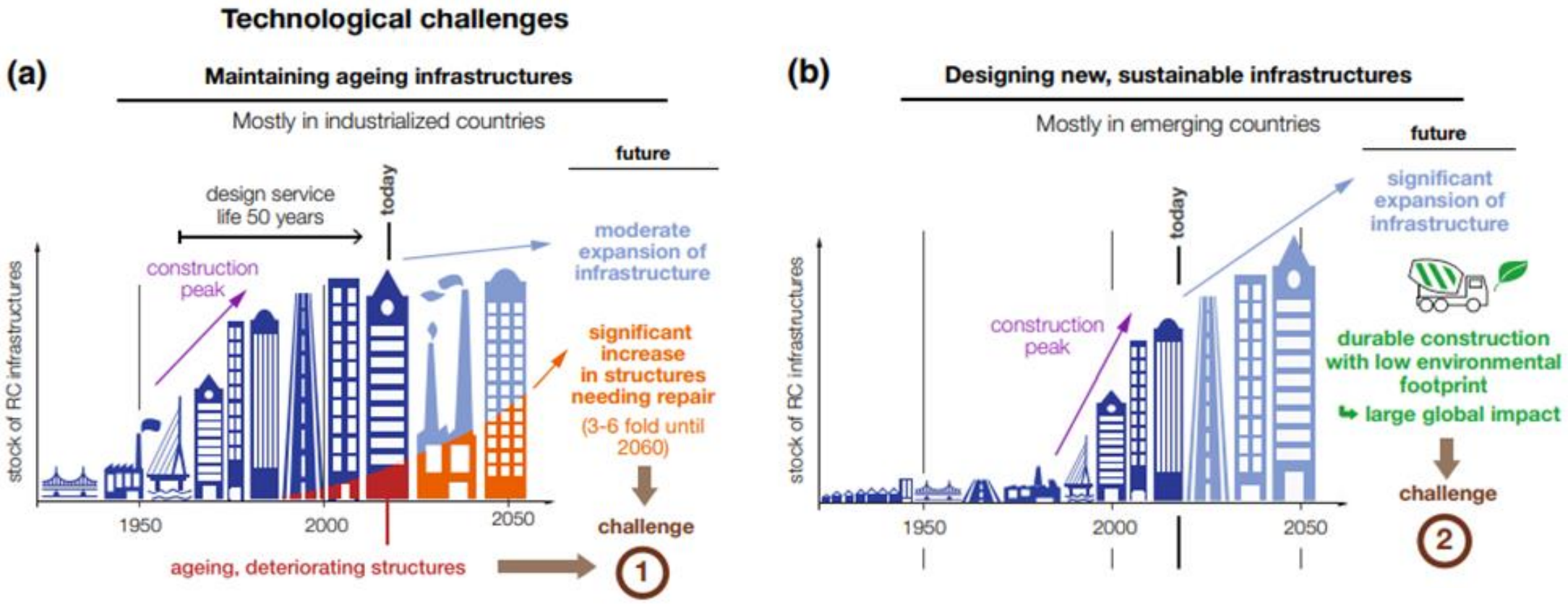
Source: IStructE



Modular, plug & play geopolymer anodes to protect new construction from day 1

Built geopolymer concrete

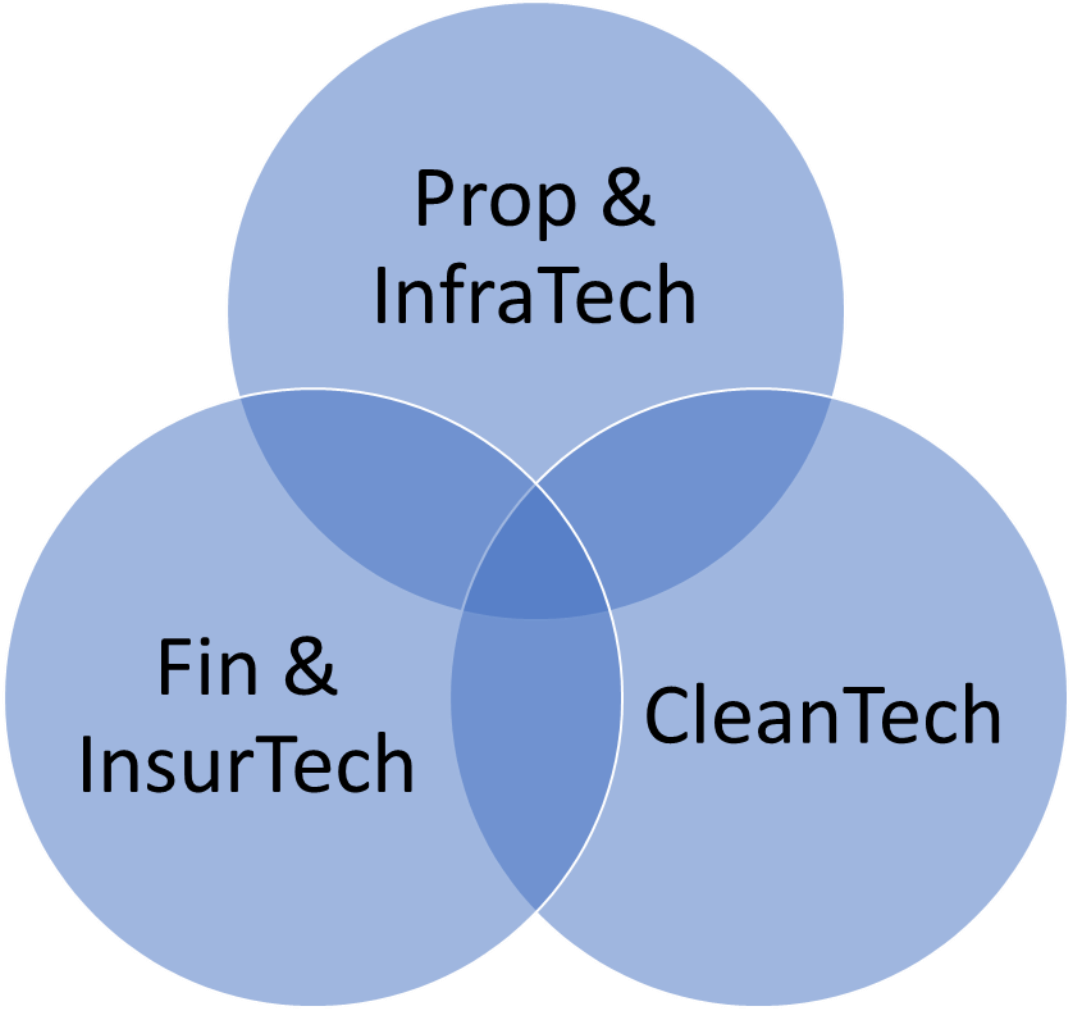
A Changing Landscape with Challenges



ref: *Angst, U.M., Challenges and opportunities in corrosion of steel in concrete, Materials and Structures, 51:4, 2018*

Technology at the heart of Built World

Technology to automate, streamline and improve the way we buy & warrant, build and manage buildings and infrastructure on a low carbon sustainable basis



Environmental Product Declarations (Type III EPDs)

bre

Statement of Verification

BREG EN EPD No.: 000578 Issue 01

This is to verify that the
Environmental Product Declaration
provided by:
C-Probe Systems Limited

BRE Global Verified EPD

is in accordance with the requirements of:
EN 15804:2012+A2:2019
and
BRE Global Scheme Document SD207

This declaration is for:
1kg of LoCem® anode binder

Company Address

C-Probe Systems Limited,
Unit 2 Wharton Street,
Sherdley Road Industrial Estate,
St Helens,
WA9 5AA

C-PROBE

Emma Baker — Operator — 27 June 2024 — Date of this issue
Signed for BRE Global Ltd

27 June 2024 — Date of First Issue
26 June 2029 — Expiry Date

BRE Global Verified EPD

ECO PLATFORM EPD VERIFIED

BF1805-C-ECOP Rev 0.3 Page 1 of 18 © BRE Global Ltd, 2022

- Independently verified (Type III)
- First EPDs issued for low carbon geopolymer materials for maintenance of structures
- First EPD issued for low carbon cathodic protection systems
- LCAs using Ecoinvent from Stage A (production) through to Stage D (Scope 3 circularity)

Environmental:

Repurposing industrial wastes to form AACM anode material

Build with AACM

Reduced water use in mix designs

Room temperature blending of AACM powders

Sustainable resilience of embodied carbon

Social:

Control of degradation offers sustainable legacy for the future

Avoiding future concrete repairs reduces cost and disruption

Reduced use of resources through controlled maintenance

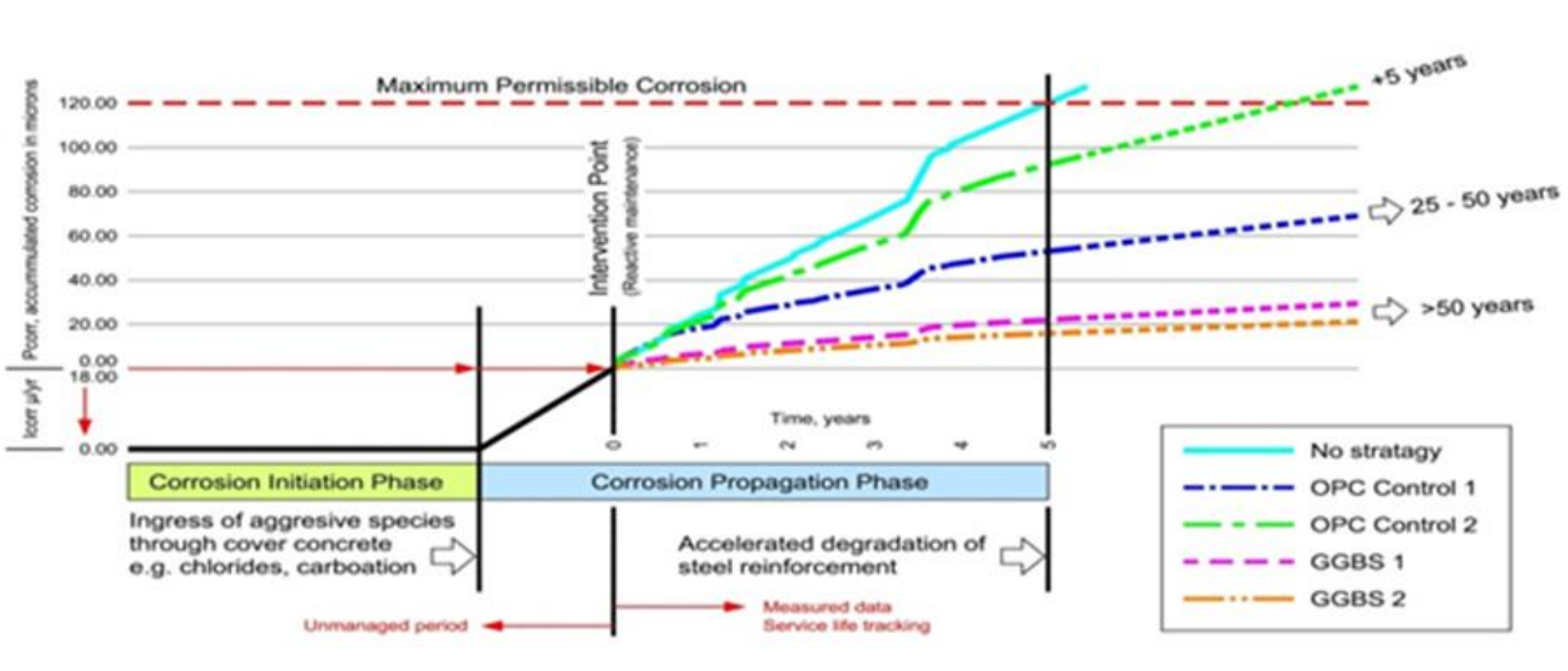
Governance:

Performance data reported through whole life tracking from embedded sensors

International Standards apply

Asset value assured

Service Life Tracking using Pcorr data

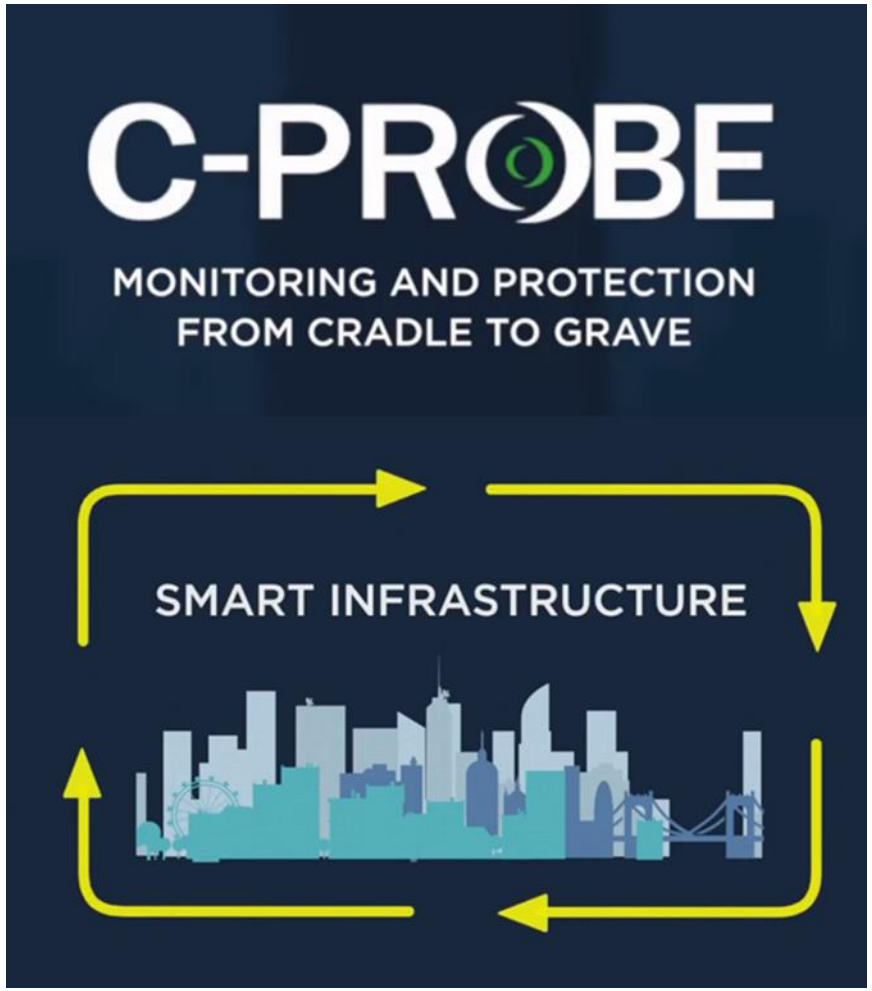


Thank you for listening

How to get in touch:

Email address
gjones@c-probe.com (Graeme Jones)
jos@kcc-act.nl (Jos Kronemeijer for NLD, BEL & DEU)

Website
www.c-probe.com



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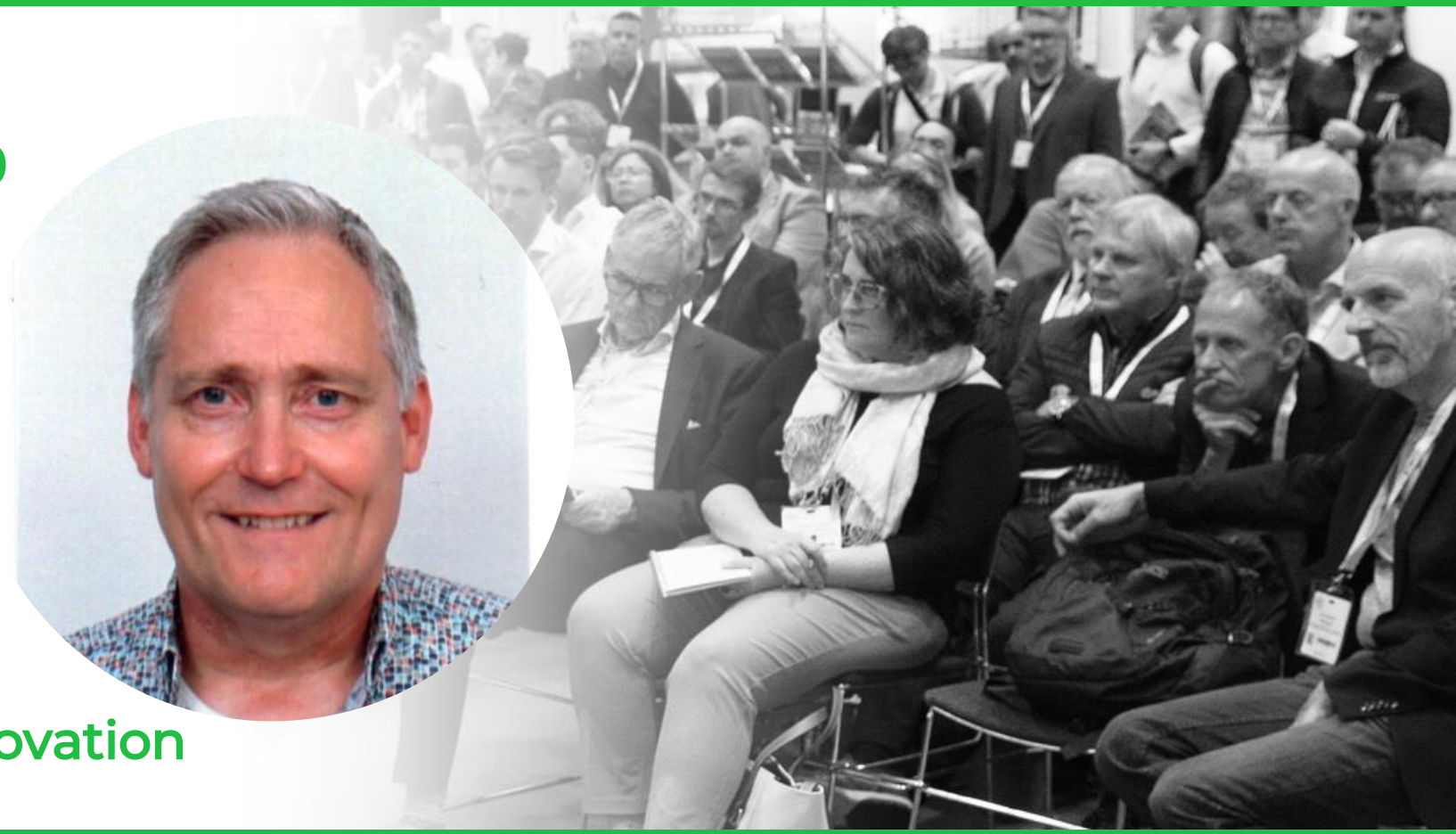

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Senior Materials Technologist
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Kronemeijer Concrete Consult

Global infrastructure: major projects driving innovation

Geopolymer concrete

Demonstration project: Railroad underpass

In 1835, some 10 years after the British, the Dutch rushed to follow this dashing technological innovation and introduced their version of a first passenger railway line; situated between Amsterdam and Haarlem.

In 2019 , this time a mere 15 years after the British, the Dutch followed yet another dashing technological innovation and introduced their version of an ‘Alkali-Activated Cementitious Material (a.k.a. ‘geopolymer’) to be used as a **low-carbon binder system** for **structurally reinforced concrete** in a railroad underpass.

Dutch railroad authorities grant significant discounts to contractor’s quotations showing validated carbon-footprint reductions.

In order to be eligable for placement, the applicants had to show ‘having done their homework’:

- showcasing likelihood of a design service life of 100 years in given exposure conditions;
- showcasing validated CO_2 reductions of ≥ 30% compared against conventional CEM III/B -based concrete…

→ distinguishing features of *their* AACM:

- high chloride-diffusion resistance
- high fatigue resistance

Geopolymer concrete

Demonstration projects: Dike revetment

In 2021, some ⅔ of the Dutch population lives behind dikes, because their land is sensitive to flooding.
The 'Afsluitdijk', a 35 km-long icon of a dike built in the early 30's, has recently undergone large-scale "future-proofing".
It's prepared for sea level rise and heavier wave attack anticipated for the next 85 years of its service life.

Rijkswaterstaat
Ministry of Infrastructure and Water Management

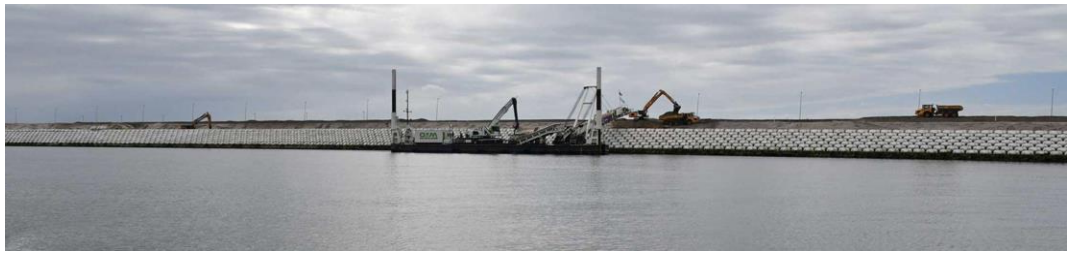
Dutch water management authorities chose for elevating the crest and applying a cover of wave-dissipating interlocking non-reinforced concrete blocks. Specific areas designated for innovations testing with blocks made of 'low-carbon concretes'.

Dutch Ministries *all* grant significant discounts to contractor's quotations showing validated carbon-footprint reductions.

In order to be eligable for placement, the applicants *again* need to show 'having done their homework':

- showcasing likelihood of a design service life of 100 years in given exposure conditions;
- showcasing validated CO_2 reductions of ≥ 40% compared against conventional CEM III/B -based concrete…

SCS
Sustainable Concrete Solutions



→ distinguishing features of *their* AACM:

- ❖ high sulfate resistance
- ❖ high abrasion resistance

https://www.xbloc.com/
https://www.vanoord.com/nl/projecten/de-afsluitdijk-een-multifunctioneel-icoon/

Geopolymer concrete

Demonstration projects: Quay walls

The Dutch have 4 major European rivers (Eems, Schelde, Maas and Rijn) flowing from over their soil into the North Sea .
The 'Port of Rotterdam', an icon of efficiency regarding transfering goods to the hinterland is "future-proofing" too.
It strives for increased durability and sustainability at the same time for *all* of its assets.

Port of Rotterdam

Port authorities of Rotterdam chose **hybrid-reinforced low-carbon concrete** for quay walls at the 2nd Petroleum Haven.
One future desire as extension of this concept would be permitting using precursors derived from harbour sludge.

Dutch Port Authorities *all* grant significant discounts to contractor's quotations showing validated carbon-footprint reductions.

In order to be eligable for placement, the applicants *again* need to show 'having done their homework':

- showcasing likelihood of a design service life of 100 years in given exposure conditions;
- showcasing validated CO_2 reductions of ≥ 50% compared against conventional CEM III/B -based concrete…

SQAPE TECHNOLOGY

→ distinguishing features of *their* AACM:

- ❖ high seawater resistance
- ❖ optional use of proprietary precursors

Geopolymer concrete
Lessons learned and the road forward

The **Dutch Building Code** is entirely compliant to European standards;
FIB Modelcode 2020 and therewith **Eurocode 2** (EN 1992-1-1) for structural concrete applications *does not prohibit use of AACM's …*

The Dutch **National Annex** to **EN 206** providing specifications for materials for structural concrete, *does not yet cover AACM's …*

Formal reason behind extremely sluggish adoption into Dutch certification programmes:
"*Geopolymer is only a popular collective term for AACM's; they come in many distinct flavours …*

Some Dutch asked themselves: "*Why don't we follow British example (again ;-)*
and learn how they overcame this bureaucratic obstacle on nomenclature definitions ?"

The answer → we convinced authorities on throroughness using <u>your</u> 'equivalent performance approach' ...

And …. we followed your countryman prof. John Provis' advise given in a seminar at TU/delft in 2019,
to "*not immediately build a skyscraper with it, but first carefully select structural members that can be easily monitored and if-need-be easily repaired or even replaced and simply continue extending shared confidence from there …"*

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