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Exploiting the sculptural
potential of concrete

DECARBONISING CONSTRUCTION

The role of the main contractor
in a lower-carbon industry

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3D-printed bridge built
with recycled materials



DECARBONISING CONSTRUCTION BY INVESTING IN LOW-CARBON INNOVATION

Rossella Nicolin of **Laing O'Rourke** looks at the role of a main contractor in working with the whole concrete supply chain to help bring about a lower-carbon construction industry.



The built environment and construction sector account for nearly 40% of global carbon emissions. While the bulk of these emissions are operational – resulting from the energy needed to heat, cool and power buildings – 11% of emissions come from materials and construction, otherwise known as embodied carbon, according to the World Green Building Council⁽¹⁾. As countries around the world strive to achieve a net-zero transition, while addressing social and economic inequalities, the need for more buildings and infrastructure has intensified. To decarbonise transport, railways

must be upgraded and EV charging infrastructure must be enhanced and extended. To eradicate fossil fuel use while meeting increasing demands for electricity, clean energy generation must be built. And to alleviate social inequalities, modern facilities that deliver fair access to healthcare, education and employment opportunities must be provided. In short, the construction sector must find new ways to deliver the buildings and infrastructure that society needs, while minimising its impact on the environment. Decarbonising materials is a significant part of this challenge. As a contractor, 96% of Laing O'Rourke's greenhouse gas

emissions fall within Scope 3⁽²⁾, that is to say they are indirect emissions that the company does not have direct control over. Of these emissions, purchased goods and materials account for over 90% of the business' Scope 3 footprint, with concrete being one of the most carbon-intensive materials.

LOW-CARBON CONCRETE

As a founding member of ConcreteZero, a global, industry-led initiative to achieve net-zero concrete by 2050, Laing O'Rourke is focused on developing and implementing solutions to scale up low-carbon production and sourcing of concrete.

In April 2023, the business announced a flagship initiative to mandate the use of low-carbon concrete on all its new UK projects. This decision was reached following a two-year research and development programme, Decarbonising Precast Concrete Manufacturing (DPCM)⁽⁵⁾, co-funded by Laing O'Rourke and Innovate UK, and with the support of academic partners from the University of Cambridge and Sheffield University's Advanced Manufacturing Research Centre.



ABOVE: Views inside Laing O'Rourke's Centre of Excellence for Modern Construction (CEMC), Nottinghamshire.

The DPCM programme explored available and emerging decarbonisation technologies, provided detailed assessments of high-value, high-impact options, undertook tests and manufacturing trials of potential solutions, and developed implementation plans to enable rapid business adoption. Seven concretes were used in preliminary laboratory trials, with several criteria assessed, including strength, consistence, embodied carbon and carbon-reduction potential, supply chain maturity, technology readiness, and manufacturing readiness. Learnings from this programme resulted in the business mandate, which provides a minimum standard for low-carbon concrete, aligned with Construction Leadership Council's Low Carbon Concrete Group's (LCCG) definition of Grade A, or better.

AN INNOVATIVE MINDSET

To build on the results of the DPCM programme, work is ongoing to ensure that Laing O'Rourke's solutions are fit for a net-zero future. While today's solution inevitably includes industrial by-products, such as GGBS and fly ash, the company recognises that their role must be transitional. The in-house team is continuing to conduct trials across a range of alternative materials, including cement-free and ultra-low-carbon options. In the long-term, the firm expects to use



more abundant natural alternatives, including calcined clays and volcanic pozzolans.

Another decarbonisation opportunity lies in concrete reinforcement, which today is largely provided by steel. Although much of the steel used by Laing O'Rourke is recycled, the supply is finite and the company is trialling alternative materials, such as fibre-reinforced basalt, with promising early stage results.

While investment in lower-carbon materials will be vital to accelerating decarbonisation, the lowest carbon kilogramme of concrete is the one that is not used at all. Equal effort and ingenuity are being deployed in working with design partners and stakeholders to trial highly efficient designs, where excess material use can be eliminated from the start, enabling the delivery of buildings and infrastructure with lower embodied carbon.

LEARNING AND COLLABORATION

Low-carbon concretes can be deployed as a like-for-like substitute for traditional mixes, but controls and incentives must be introduced

to ensure accountability and progress. The use of low-carbon concrete on projects since April 2023 has been a project KPI across the UK business, reported monthly and is linked to remuneration. Additionally, data integrity, strong supplier relationships and appropriate adjustments to systems are vital to ensuring that new methods and technologies are maintained.

Leveraging achievements and learnings to share knowledge is imperative to industry progress.

Partnerships and collaboration with industry peers in pursuit of a shared objective will ultimately progress research and development of ultra-low-carbon materials, design and systems.

The market is maturing rapidly, but there is still a long road ahead on the journey to net zero. Collaboration and collective action are essential to achieving global decarbonisation goals. Working across the concrete and construction industries to test and commercialise new, decarbonised solutions will be the key to success. **C**

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