



“The results of the trial are extremely encouraging. By working together, we have been able to speed up the process of testing and analysing a new solution for de-carbonising our road network, with the aim of getting it to market so the whole industry can benefit.”

Skanska's highways director, Glennan Blackmore

Solutions



Sustainable Construction

Paving the way for net zero roads

In 2022, it was announced that Tarmac, Skanska UK and National Highways low carbon concrete trial would be extended to permanent roads. Over the past year, Skanska, alongside the National Composites Centre, Tarmac, Basalt Technologies and National Highways, carried out a trial on a low carbon reinforced concrete solution.

The results show that the solution has led to a reduction of more than 50% in carbon. It has also proven to be equally resilient as conventional reinforced concrete using steel. Skanska has now published a report on the trials conducted on its M42 junction 6 project for National Highways.

The trial has proven to be such a success that Skanska is now working collaboratively with National Highways and High Speed 2 Ltd (HS2) on the next phase. The plan is to trial the low carbon combination on a permanent road and capture all the data and analysis for future publication. The ultimate aim is to roll out the low carbon solution across the UK's strategic road network.

Skanska is also working with HS2's innovation managers to progress the insights from the trial and use the innovative combination of materials in other structural reinforced concrete elements beyond roads.

Skanska's highways director, Glennan Blackmore, said: *“By using a unique combination of materials, we are working to not only cut carbon, but also improve the structural performance of reinforced concrete, delivering better productivity, safety and cost outcomes. We're delighted to*

see the success of this trial and we're now really looking forward to starting the next stage.”

Tarmac provided two types of concrete for the trial: a mix comprising conventional blended cementitious material and a low carbon alternative mix incorporating an alkali-activated cementitious material (AACM) in place of the cement. This low carbon concrete solution was mixed at a conventional concrete plant located close to the project and installed in exactly the same way as traditional materials. This new sustainable product delivers a carbon footprint up to 80% per tonne less than a standard CEM I concrete.

The reinforcement steel replacement used in the trial was a basalt fibre reinforced polymer rebar. This is five times lighter and twice as strong as its steel counterpart, and is naturally resistant to corrosion, alkalis and acids. The main components of Bastech® rebar is basalt fibre which is manufactured directly from the most common rock on the earth's surface, basalt, in a single-melt process, and comprises only a single raw material. On average, it has 60% less CO₂ emission than steel and is a cost-effective substitute.

The road was heavily used by construction vehicles throughout the trial period, with in-situ and laboratory tests carried out over a number of months. Full scale specialist lab tests involved bending and shear testing of the four types of slabs.

The results have provided knowledge of the curing process, ease of construction, safety benefits, functional properties and structural behaviour of the various concrete and reinforcement combinations. This has given insight into the future use of longer-lasting materials in construction.

The trial also provides a better understanding of the impact of using the new materials - including the use of composites in the design of concrete structures - ahead of the proposed revision to Eurocode 2 standards.