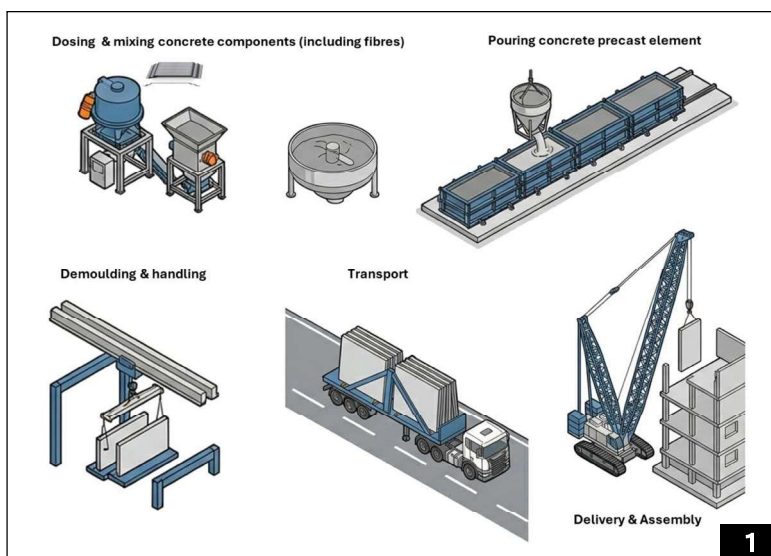


REINFORCED BY DESIGN: FIBRES IN REBARS OUT

As Danilo Di Giacinto, Business Development Manager Infrastructure at Bekaert Sustainable Construction illustrates, the construction industry pushes deeper into offsite production and standardised assembly, Steel Fibre Reinforced Concrete (SFRC) is rewiring how precast concrete is specified, manufactured and delivered reducing complexity.



controlled tensile strength, geometry and aspect ratio governing pull out resistance and post crack behaviour (Image 2). Where plain concrete is brittle and fails abruptly, SFRC redistributes tensile stresses across the fibre network, absorbing energy and maintaining structural integrity well beyond initial cracking.

The DfMA fit

This is where SFRC directly supports offsite strategy and DfMA outcomes. DfMA is about elimination: removing process steps that add cost, risk, and variability without adding value. Conventional reinforcement in precast manufacturing clearly fails this test. It requires manual cutting, bending, cage assembly, placement, and inspection, a labour-intensive, drawing-dependent sequence completed before any concrete is placed. SFRC eliminates this process entirely. The DfMA value is systemization – specify fibre performance, control

dosing and mixing, and verify through routine testing. With no cages, no schedules, and no tolerances to manage, production cycles shorten, labour dependency falls, and output aligns with the pace of concreting itself.

Standardisation & MMC categories

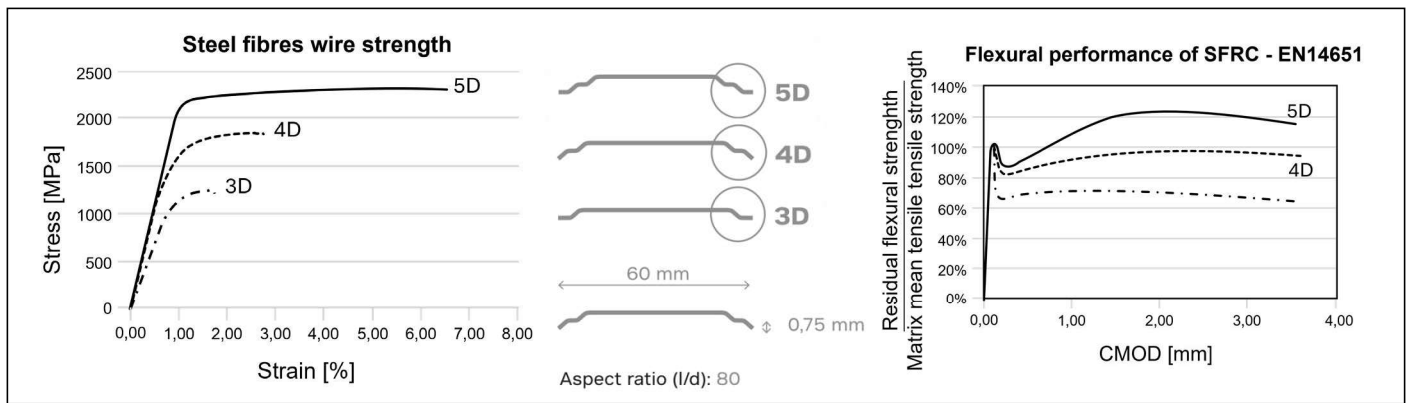
The standardisation benefits cascade further. Because reinforcement is distributed homogeneously rather than concentrated in bespoke layouts, the same SFRC concrete specification can often be applied across a family of components. A precaster supplying a modern methods of construction (MMC) programme can choose to optimise dosages by product type or standardise a single mix design and supplement it with local hybrid reinforcement where required. This is the kind of platform thinking that DfMA promotes, and SFRC delivers it at material level with structural performance derived from standardised flexural testing to EN 14651. For MMC supply chains, the fit is equally clean. SFRC precast elements integrate seamlessly, for instance, into Category 1 (volumetric modular, e.g. bathroom/kitchen pods) and Category 2 (panelised, wall cladding panels) MMC systems without rework or structural compromise.

THE INDUSTRIALISATION OF CONSTRUCTION has a concrete problem. Not a problem with concrete itself but a problem embedded within it – traditional steel reinforcement. Every rebar cage is, by definition, a bespoke fabrication exercise. Bars are cut, bent and tied to suit a specific drawing. In a factory seeking repeatability and throughput, that variability is not a detail – it is a structural inefficiency that undermines the rationale of Design for Manufacture and Assembly (DfMA).

What is SFRC?

SFRC resolves this contradiction. Instead of positioning reinforcement at discrete, drawing-specific locations, steel fibres are batched directly into the concrete during mixing, forming a continuous three dimensional reinforcing network (Image 1). The result is a homogeneous composite material, reinforced throughout its volume, consistent between batches, and inherently suited to automated formwork and controlled factory production.

The principle is not new. Fibre reinforcement has evolved since the 1970s, but the performance envelope of modern hooked end steel fibres is far removed from early generations. Today's fibres are engineered at the wire drawing stage, with



Not all fibres are equal

Steel fibres are recognised as structural reinforcement under Annex L of Eurocode 2, providing residual tensile strength that may be directly credited in load bearing design. By contrast, synthetic fibres are deemed non-structural – while they control plastic shrinkage, they lack properties to be credited for ultimate limit state capacity.

Conclusions

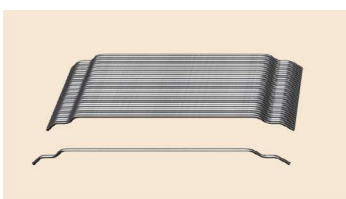
The performance case for SFRC is strong. By enabling thinner, optimised sections and eliminating discrete reinforcement inefficiency, SFRC can reduce total steel consumption by up to 30% and embodied carbon by up to 35% in precast and infrastructure applications. DfMA is about removing avoidable

complexity. Processes require enabling materials, systems conceived to support factory production, repeatability and rapid assembly. SFRC is one such material. It was a DfMA solution before the industry had a name for the concept. A practical route is to start with one element family, define performance targets and then scale as confidence grows. ●

Find out more at: www.bekaert.com
www.construction.bekaert.com

Image 1: Adding concrete reinforcement in the form of steel fibres during the dosing and mixing stage streamlines the production of precast concrete

Image 2: The Dramix® range at a glance: from crack control to structural reinforcement



Using Dramix® steel fibres to reinforce your concrete allows the creation of reliable and long-lasting precast elements of any design, no matter how complex.

Contact our local expert: danilo.digiacinto@bekaert.com or visit our website: www.construction.bekaert.com/precast.

