

 **FIBRECRETE®**

Fibre reinforced concrete

> Introduction

Hanson Concrete is the UK's largest supplier of ready-mixed concrete and has a national network of over 180 static and mobile production plants.

We produce quality-assured, ready-mixed concrete, designed to suit any application and our ready-mixed concrete solutions have been specially developed for civil engineering professionals.

We've used this expertise to develop a range of fibre reinforced concretes to suit many different applications in conjunction with our partner Sika, a leading supplier of fibres and experts in concrete technology.



In association with Hanson

> Fibres in concrete

Fibres added to ready-mixed concrete improve the structural performance of the product. They increase tensile strength and reduce the potential for early-age plastic shrinkage cracking. In deeper sections, settlement and bleed are also reduced resulting in superior surface durability.

Concrete becomes more durable and resistant by adding fibres to the mix during production. This results in the reduced use of crack control reinforcing mesh and, in many instances, negates its use altogether. Significant savings in construction costs can be made with the added benefit of a superior concrete quality.

Benefits of fibre reinforced concrete:

For the engineer:

- Reduced plastic shrinkage cracking
- Reduced settlement and bleed in deeper sections
- Improved surface durability
- Improved cohesion of the fresh concrete
- Greater flexural and shear strengths
- Improved load capacity and ductility
- Increased abrasion resistance
- Increased fire resistance
- Potential to reduce CO₂

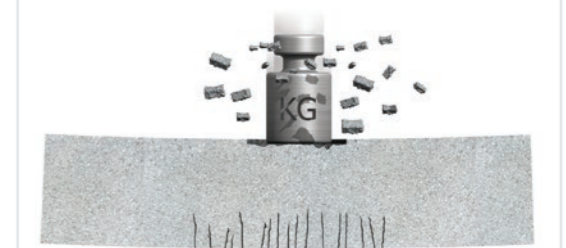
For the contractor:

- Speed of construction is greatly increased
- Eliminates risk of incorrect placement and movement of conventional mesh
- Lower construction costs
- Easier construction method
- Improved health and safety on site

Higher flexural and shear strengths



Improved load capacity and ductility



Increased fire resistance





> Fibrecrete® micro (non-structural)

Non-structural fibres, like SikaFibre® PPM-12, are classified as an addition rather than an admixture and can be added to almost all conventional concrete mixes. Concrete mixes incorporating fibres comply with current European and British standards and require no additional specification criteria.

Applications:

The majority of concrete mixes will benefit from the addition of fibres. Specific uses include:

- Concrete slabs/external paving
- Deep sections >500mm
- Strip footings and foundations
- Concrete elements with a high length to width ratio (e.g. pathways/kickers)

Benefits:

- Reduced shrinkage (less crack potential)
- Increased resistance to freeze thaw damage when used with a conventional air-entraining agent
- Reduced potential for settlement cracking
- Reduced risk of delaminating
- Increased surface durability

Synthetic micro fibres:

Synthetic micro fibres have an even lower E-modulus (3 – 5 GPa) than synthetic macro fibres. They're mainly used to reduce early-age shrinkage cracking and improve fire resistance, thanks to their low melting point (160°C). Like macro fibres, they're also corrosion-resistant.



> Fibrecrete® macro (structural)

Structural fibres, like SikaFibre® Force 400, are manufactured from a high-strength, high modulus synthetic plastic. They're designed to replace welded mesh and light reinforcement bars.

Applications:

- Suspended floors and roof elements
- Large scale industrial floors
- Lightweight applications
- Architecturally sensitive buildings
- Complex, geometric elements

Benefits:

- Reduced overall construction cost when compared to steel reinforcement
- Reduced manual handling and placement time (no steel fixing)
- Increased crack control
- No associated corrosion issues
- Eliminates concerns associated with correct placement and cover of reinforcement materials
- Reduced structural weight (suspended slabs/roof elements)

Synthetic macro fibres:

Synthetic macro fibres have a lower E-modulus (5 – 15 GPa) than steel fibres. They're effective in the early phases of hardening to prevent and/or reduce the size of cracks developing in the concrete but, unlike steel fibres, can't take extremely high loads. Synthetic macro fibres are also corrosion-resistant and give the concrete greater ductility.





> Fibrecrete® steel

Structural steel fibres are manufactured in various grades, deformations and sizes to suit most concrete flooring applications.

Applications:

- Heavily trafficked industrial paving
- Industrial ground bearing slabs
- Jointless ground bearing slabs
- Suspended slabs on piles
- Impermeable concrete slabs

Benefits:

- Reduced overall construction cost over conventional steel
- Reduced manual handling and placement time (no steel fixing)
- Increased crack control
- Eliminates concern associated with correct placement and cover of reinforcement materials
- Increased surface abrasion resistance

Steel fibres:

Steel fibres are characterised by high E-modulus (200 GPa) and high tensile strength (2,500 MPa). They prevent creep of the concrete but don't counteract early-age shrinkage. If any corrosion occurs, it won't cause spalling of the concrete – just a change of colour on the concrete surface. Protruding steel fibres can pose a risk of injury or damage to waterproofing membranes.



> Fibrecrete® home

Hanson's Fibrecrete® home structural topping for beam and block flooring systems incorporates a BBA approved fibre that meets NHBC standards and complies with BS EN 14889-2:2006. It's an ideal solution for housebuilders and ground workers to use for domestic floor concrete toppings.

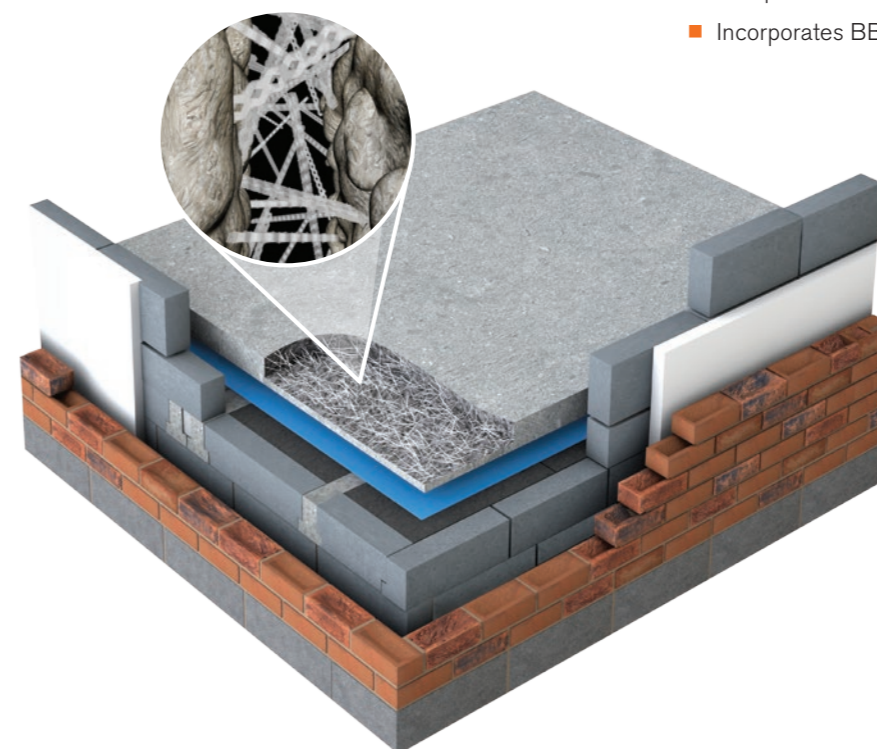
When used with the appropriate design and at the recommended dosage, Fibrecrete® home provides improved concrete toughness and alleviates the need for steel mesh. This makes it particularly suitable for use in structural toppings for beam and block flooring systems.

Applications:

- Domestic floor concrete toppings
- Traditional beam and block
- Ground floor insulated beam and block

Benefits:

- Available nationwide
- Easier and safer to handle than steel
- Reduced construction time
- Ready-mixed concrete trucks can discharge at the 'live' edge of the concrete
- Cannot be misplaced
- No need to cut, fix or place steel mesh
- Reduced wear on concrete pumps
- Reduced carbon footprint
- Fibres do not rust or corrode
- Provides a 3-dimensional reinforcement system
- Supplied to Hanson's quality standards
- Complies with BS EN 14889-2:2006
- Incorporates BBA approved fibres





➤ Applications

Fibres are the ideal component for enhancing and improving concrete and mortar because they're easy to work with and bond well within the mix, whatever the application. They can increase impact resistance and reduce cracking damage in roads, bridge decks, floor screeds and precast concrete units. In addition, fibres can improve the ductility of sprayed concrete linings and increase the fire resistance of tunnel linings.

Sprayed concrete

The addition of fibres increases the ductility of sprayed concrete. If the sprayed concrete lining of an excavated tunnel support is cracked due to high flexural stresses, the fibres can accommodate tensile forces and act as an excellent yielding support. Fibres also increase the mechanical capacity of the lining, allowing extra reinforcement to be reduced or even omitted. This ultimately results in tunnel excavation supports that are quicker to install and more cost-effective.

Fire protection

Synthetic micro fibres increase the fire resistance of concrete, which is particularly important in structures like traffic tunnels. If a fire were to break out, the synthetic fibres within the concrete melt and create a capillary system through which water vapour pressure can be relieved. Concrete spalling is either reduced significantly or prevented completely, so the amount of repair work required is also reduced. All this results in a structure that is safer, more stable and more durable.

Slabs, runways and roads

Using fibres in concrete floor slabs and runways helps to stabilise the mix and greatly reduces early-age shrinkage cracks. Fibres also result in better flexural behaviour, greater impact resistance and greater durability. This means the amount of extra reinforcement needed can be reduced and the joint spacing increased. Fibres also help to prevent the joints and other perimeter edges from shearing.

Refurbishment

Repair mortars formulated and produced with fibres have greater durability with improved crack distribution, as well as an increased working capacity due to their crack-bridging ability. Their improved internal cohesion also allows spray-applied layers of greater thicknesses to be placed, increasing the application rate and reducing the overall cost.

High strength concrete (HSC) and ultra-high performance concrete (UHPC)

Particularly slender components usually require HSC or UHPC, as do projects where high structural and load-bearing stability is needed during extreme conditions. Thin, short fibres that have a high E-modulus can be used in these cases. This means extra, untensioned reinforcement can be reduced or combined with the fibre reinforcement to greatly increase energy absorption capabilities.

➤ Case studies

Ferrybridge site plant, Knottingley, West Yorkshire

Fibrecrete® macro concrete has been used to create the foundations for Hanson's site batching plant at the Ferrybridge Multifuel 2 scheme in West Yorkshire.

Hanson is the preferred supplier of concrete to the project, which will be the second multifuel plant to be constructed on land at Ferrybridge C Power Station in Knottingley.

"The specification for the foundations of our plant was to use steel mesh reinforcement in the concrete," said area general manager John Neesham. "Through discussion with contractor PJ Carey we agreed to trial the use of Fibrecrete®, supplied by our nearby concrete plant in Castleford, as it offered time and cost savings as well as ease of placement."

"With positive results, we're now working with the contractor and client to extend the use of Fibrecrete® to the main construction phase."

Greengill anaerobic digestion plant, Penrith, Cumbria

Hanson is supplying its Fibrecrete® macro concrete to a renewable energy project in Penrith, Cumbria.

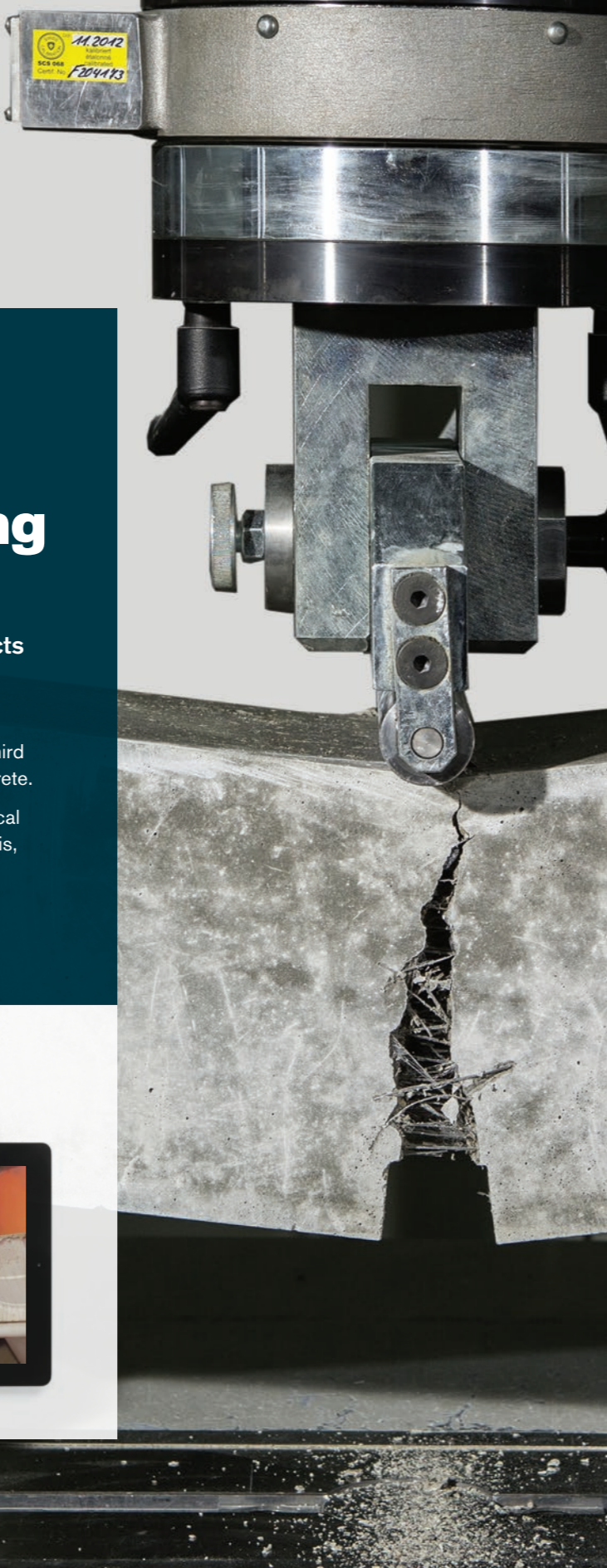
A 2.4MW anaerobic digestion (AD) plant is being constructed on land at Greengill Farm and will produce approximately 8MkWh of electricity a year – equivalent to the average use of 2,400 households.

Fibrecrete® is being used to construct the huge storage tanks that house the silage before it's fed to the AD plant. The product was specified by contractor Tim Kemp.

"The original specification for the tanks was a concrete with reinforcing mesh to provide the structural performance required," said Tim. "But I have used Hanson's Fibrecrete® on previous projects and know what it can deliver in terms of time and cost savings. With this proven track record it was not difficult to convince the client of its benefits and the results speak for themselves."

Hanson is supplying over 5,000 cubic metres of concrete to the project, including 3,000 cubic metres of Fibrecrete®, from its nearby Penrith plant.

This project was supported by Sika's specialist technical team from start to finish, including mix design and site support.



> Hanson quality, testing, technical support and batching

Hanson is a member of the Quality Scheme for Ready-Mixed Concrete (QSRMC) and all our products carry the accreditation.

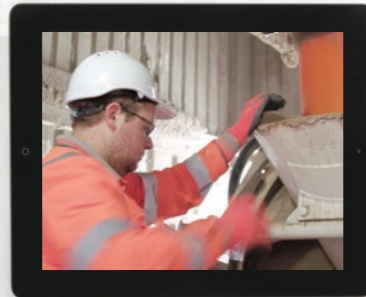
Samples are tested at our national UKAS accredited laboratory in accordance with current European and British Standards under third party accreditation by the Quality Scheme for Ready-Mixed Concrete.

We provide nationwide technical advice, with our concrete technical managers offering expert guidance and site support. Alongside this, we are supported by Sika's technical managers.

All our plant batchers are fully trained to ensure every Fibrecrete® delivery is of the highest quality.

> See Fibrecrete® in action

Visit our website hanson.co.uk
or our YouTube channel
[youtube.com/HansonUK](https://www.youtube.com/HansonUK)



> Contact us

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Hanson UK is a leading supplier of heavy building materials to the construction industry.

We produce aggregates (crushed rock, sand and gravel), ready-mixed concrete, asphalt, cement and cement-related materials. We are part of the HeidelbergCement Group, which has leading global positions in aggregates, cement and concrete. Hanson UK is split into four business lines – aggregates, concrete, asphalt and contracting and cement – which together operate around 300 manufacturing sites and employ over 3,500 people.

For detailed information on all areas of Hanson and our products visit hanson.co.uk

BULK CEMENT

- Regen (GGBS)
- Grey
- White



AGGREGATES

- Sand and gravel
- Crushed rock
- Bulk decorative aggregates
- Agricultural lime
- Rock armour
- Silica sand

ASPHALT

- Era® – low temperature asphalt
- Durafalt
- Tuffgrip
- Tuffpave



CONCRETE

- EcoPlus
- Ready-mixed concrete
- Ready-mixed mortar
- Coloured concrete – Colourcrete
- Piling concrete – EasyPile
- Watertight concrete
- Sprayed concrete
- Reinforced concrete – Fibrecrete®



PACKED PRODUCTS

- Cement
- Ready-to-use mortar
- Ready-to-use concrete
- Asphalt
- Construction aggregates
- Decorative aggregates
- Sands
- Rock salt



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