

Fibre Reinforced Concrete



*Making Good
Concrete Better®*



Making Good Concrete Better®

For decades, **SI Concrete Systems (SI)** has provided innovative solutions to the construction industry with superior products, service and responsiveness. Our continuing dedication to excellence drives us to meet your demands for ways to solve today's toughest concrete construction problems, making us the largest producer of synthetic fibres for reinforcement of concrete in the world.

Concrete producers, contractors, engineers, specifiers and owners can consult with our worldwide team of fibrous concrete specialists. They benefit from the most comprehensive array of superior fibre reinforcement systems in the industry for slab on ground, shotcrete, precast and other concrete applications.

Our ISO 9002- and 14001-certified manufacturing facilities assure world-class, environmentally friendly products. At **SI Concrete Systems**, quality and reduction of pollution, waste and other negative environmental impacts are our primary goals.

The success of **SI's Fibermesh®** family of products is largely the result of anticipating and responding to our customers' changing needs. We constantly look for innovative ways to apply new technologies toward solving customers' problems with cost-effective products.



concrete's

problem

Concrete producers, contractors, engineers, architects, homebuilders and construction professionals worldwide will agree on one thing – cracking in concrete can be everything from a nuisance to a nightmare. No matter where cracks occur, they are a problem. The repair of problematic cracking is often just as serious and costly.

Historically, the tendency for concrete to crack has been accepted as inevitable. Why does concrete crack? Cracks occur because stresses exist which exceed the strength of the concrete at a specific time.

Structural cracking

The constant loads of traffic on a major highway, heavy machinery used in industrial facilities and poor support under a concrete slab can all lead to cracking. To combat structural cracking, engineers conduct a serviceability analysis of the structure assuming a cracked section and design the concrete slab to withstand the various stresses likely to exist from external forces.

Intrinsic cracking

Internal stresses are also problematic for people in the concrete industry. These intrinsic stresses caused by shrinkage within the concrete itself have historically been a problem to control because of their unpredictable variety and occurrence. The most common type of intrinsic cracking occurs in the plastic state caused by plastic settlement and rapid evaporation of water from the slab. These cracks are formed within the first 24 hours after the concrete has been placed. They may or may not be immediately visible.

Settlement and shrinkage cracks may not be observed until some later date. They are often surface sealed by the finishing operation or are simply not wide enough to be seen until the concrete shrinks further or a load causes these weak planes to escalate into visible cracks. These cracks generally pass through the entire slab and permanently lower the integrity of the structure before the concrete has gained its design strength.

These cracks are not structural in nature, but neither do they disappear when the concrete hardens. In fact, most generally, they widen as further drying takes place. Cracks increase the water penetration into the concrete, allowing salts and other harmful chemicals to infiltrate, and resulting in unattractive projects and reduced durability and service life.

the solution

With the Fibermesh® family of polypropylene fibres, the construction industry now has a powerful tool to inhibit the formation of plastic cracking. By introducing millions of fibres into the mix, Fibermesh fibres give concrete a multi-dimensional secondary reinforcement. The result is a uniformly distributed reinforcement system that is always positioned correctly to fight plastic cracking.

By using Fibermesh fibres in concrete, you can substantially reduce the formation of plastic shrinkage and settlement cracks by increasing the tensile strain capacity of plastic concrete. This reduction or elimination of plastic cracks enables the concrete to develop its optimum long-term integrity.

When used according to the manufacturer's specifications, Fibermesh fibres inhibit 80-100 percent of the intrinsic cracking. This helps contain any cracks should they occur and provides wear protection for years to come.

Inhibits plastic settlement cracking

Simply adding Fibermesh fibres to the concrete mix creates an advanced internal support system that inhibits plastic settlement cracking. With fibres evenly distributed in the mix, segregation and settlement of concrete's heavier ingredients is discouraged and its optimum long-term integrity is achieved. This support system also results in uniform bleeding because the mix water is not displaced and rapidly forced to the surface by the downward drift of heavier ingredients.

Controls plastic shrinkage cracking

The uniform distribution of Fibermesh fibres increases the tensile strain capacity of early age concrete, discouraging the formation of plastic shrinkage cracks as concrete hardens and shrinks, the point where micro-cracks have the greatest tendency to develop. By reducing or eliminating plastic shrinkage cracks, Fibermesh fibres minimize the onset of weakened planes that develop into visible cracks.

Lowers permeability of concrete

Plastic cracks which develop during the early stages of concrete hydration allow water to pass. Fibermesh fibres do not change the density of mortar but do reduce micro-crack formation, enabling the concrete to progress from the plastic to hardened state with greater integrity. This, coupled with reduced segregation and decreased capillary formation, contributes to improving the water resistance of the hardened concrete, helping protect primary reinforcing steel against the effects of corrosion.

Resists impact and shatter forces

Impact and shatter forces are resisted due to the isotropic contributions of Fibermesh fibres. The decrease in plastic shrinkage and settlement minimizes concrete surface weakness and defects. Millions of Fibermesh fibres uniformly distributed throughout the concrete resist shattering forces.





making good concrete better®

Increases freeze/thaw durability

The introduction of Fibermesh® fibres gives concrete increased freeze/thaw durability from its early age throughout the life of the structure. Fibermesh fibres reduce water migration, giving concrete greater longevity in these environments.

Easily mixes into your concrete

Fibermesh fibres work without affecting the chemical hydration of cement and are compatible with all concrete designs and admixtures. Their action is purely mechanical and for everyday applications works without changing required mix proportions.

Added before, during or after the charging operation, Fibermesh fibres are uniformly distributed throughout the concrete after normal mixing at the rated time and speed. Over-mixing will not alter fibre performance.

Depending on the application, fibre design or aesthetic requirements of your project, different fibres at different rates may be more appropriate than others. While most fibre-reinforced concrete is easily placed without consultation, your Fibermesh representative is always available to answer any questions you might have about the correct fibre and addition rate for your project requirements.

Easy to finish

The Fibermesh family of fibres enhances all surface treatments and textures, and because it does not affect the finishability of concrete, makes for an easy finish every time.

Reinforcement that lasts

Fibermesh fibres, made from tough, durable polypropylene, are nonmagnetic and noncorrosive. Because they are unaffected by the alkaline environment of concrete, polypropylene fibres do not degrade and provide proven high performance.

Fibermesh® reinforcement Saves Time and Hassle™

- ◆ Saves construction time
- ◆ Safe and simple to use – just add to mix
- ◆ Easy to finish
- ◆ Pumpable
- ◆ Alternate system to non-structural wire mesh
- ◆ Reduces rebound and material loss in gunite, shotcrete applications
- ◆ Inhibits formation of plastic shrinkage cracks
- ◆ Acid- and alkaliproof
- ◆ Rustproof
- ◆ Chemically inert
- ◆ Improves cohesion of concrete
- ◆ Provides residual strength
- ◆ Improves durability
- ◆ Lowers concrete water migration
- ◆ Provides shatter resistance
- ◆ Adds impact resistance
- ◆ Certified by Underwriters Laboratories
- ◆ Fire rated – floors and ceilings



facts and figures



Today, you do not have to settle for the wire mesh method and gamble on it being in the right place. With the Fibermesh® family of fibres, an alternate reinforcement system, the formation of cracking during the plastic stage of concrete is reduced. It also eliminates the hassles associated with welded wire fabric (WWF).

When added to the concrete mix, Fibermesh fibres provide a three-dimensional crack-fighting system that is always placed correctly. Our polypropylene fibres distribute throughout the concrete, providing a uniform reinforcement alternative, unlike typical wire mesh, which is difficult to position properly.

By using Fibermesh fibres, the labour cost and construction time associated with wire mesh is eliminated. Simply add Fibermesh fibres to the concrete mix in the truck mixer or at the central plant for an ideally placed reinforcement system every time.

Comparing systems

How Fibermesh® fibre reinforcement systems compare to welded wire fabric in concrete

	Fibermesh	Wire fabric
◆ Reinforces against plastic shrinkage crack formation	Yes	No
◆ Reinforces against settlement crack formation	Yes	No
◆ Holds cracks together	Yes	Yes
◆ Reinforces against impact forces	Yes	No
◆ Reinforces against shattering	Yes	No
◆ Reinforces against water migration	Yes	No
◆ Rustproof and corrosion resistant	Yes	No
◆ Nonmagnetic	Yes	No
◆ Three-dimensional residual strength	Yes	No
◆ Always positioned in compliance with codes	Yes	No
◆ Safe and easy to use	Yes	No
◆ Minimum required concrete cover	0 mm	50 mm

All Fibermesh® fibres are manufactured from 100 percent polypropylene, a tough, durable synthetic resin that can withstand the harsh environments inside concrete. That, coupled with our ISO 9002-certified facilities, guarantees the customer will always receive the highest-quality fibres available.



FIBERMESH® Inforce

Fibermesh® Inforce is the new name of our trusted range of fibrillated fibres, which are designed to achieve rapid and uniform distribution throughout the concrete/parent material. These fibres are effective in controlling plastic shrinkage and settlement cracking as well as providing increases in impact and shatter resistance. They are also proven to deliver maximum post crack residual strength/toughness. In addition to our standard single length fibres, Fibermesh Inforce is now available in patented e^{3™} technology which is engineered in three ways - for length, thickness and mix ratio (see below).

STEALTH®

Stealth® - fine multi-filament fibres offer high resistance to plastic shrinkage and settlement cracking as well as providing improvements in freeze thaw resistance. They are also proven to provide explosive spalling resistance in concrete exposed to fire. Stealth fibres are well known for easy finishability and are virtually invisible on the surface. In addition to our standard single length fibres, Stealth is also available in patented e^{3™} technology which is engineered in three ways - for length, thickness and mix ratio (see below).

HARBOURITE®

Harbourite® is our range of fine fibrillated fibres which have been specifically engineered and manufactured for use in speciality cementitious based products and applications, including but not limited to shotcrete, screeds, renders and precast concrete. Designed to achieve rapid and uniform distribution in special mixes, Harbourite fibres offer resistance to plastic shrinkage and settlement cracking as well as providing increases in impact and shatter resistance.

Properties and addition rates of Fibermesh® fibres

- ◆ Absorption Nil
- ◆ Specific gravity 0.9
- ◆ Lengths (millimeters) 3, 6, 12, 19, 38, 50, e³
- ◆ Ignition point 1100°F (590°C)
- ◆ Thermal conductivity Low
- ◆ Electrical conductivity Low
- ◆ Acid, salt resistance High
- ◆ Melt point 160°C - 170°C
- ◆ Electrical conductivity Low
- ◆ Alkali resistance 100% (alkaliproof)

SI Concrete Systems now offer a new family of innovative fibres with patented e³ technology.

Just as graded aggregates enhances concrete, Fibermesh® Inforce & Stealth® with e³ technology is a blend of graded fibres designed to enhance the distribution and performance of fibre reinforcement. Each package of our e³ fibres is engineered in three ways - by length, thickness and mix ratio resulting in

Engineered, Efficient and Effective
CONCRETE REINFORCEMENT



slab on ground



Around the world, whether it's residential, commercial or industrial, concrete slabs on ground are the foundation for modern construction. Slabs on ground are often designed to perform under static and dynamic loads, impact stresses and flexural moments.

Fibermesh® fibres reduce the formation of plastic shrinkage and settlement cracks by increasing the tensile strain capacity of plastic concrete. This reduction or elimination of plastic cracks

enables the concrete to develop its optimum long-term integrity. Fibermesh fibres enhance the toughness and impact resistance of slabs on ground. Unlike welded wire fabric, Fibermesh fibres can't be misplaced in concrete.

Making good concrete better®



- ◆ Driveways
- ◆ Warehouse floors
- ◆ Shopping centres
- ◆ Sidewalks
- ◆ Manufacturing facilities
- ◆ Home construction
- ◆ Storage centres
- ◆ Hotels
- ◆ Restaurants
- ◆ Sports facilities

SI Concrete Systems is dedicated to the research, development and manufacture of synthetic products for concrete construction





applications



Some benefits of using **Fibermesh®** fibres in slab on ground applications

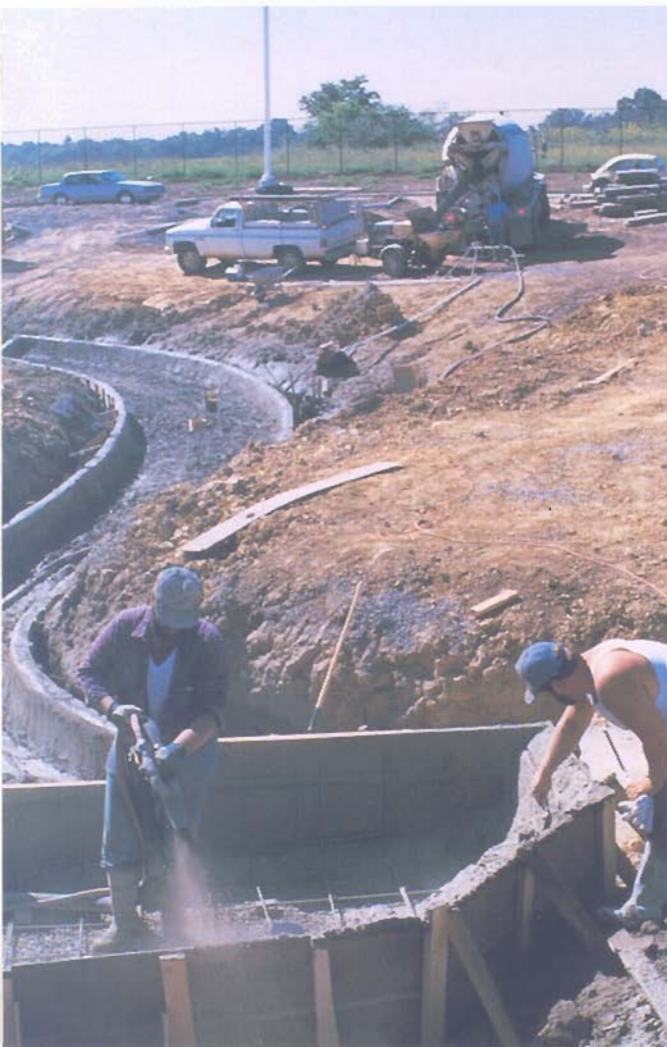
- ◆ Alternative reinforcing system to welded wire fabric
- ◆ Inhibits plastic and settlement crack formation
- ◆ Saves construction time
- ◆ Reduces labour costs
- ◆ Provides uniform, nonstructural secondary reinforcement
- ◆ Easily mixes into the concrete at the plant or at the job site
- ◆ Will not rust or corrode
- ◆ Easy to finish
- ◆ Provides toughness (residual strength: ASTM C1399-98)



shotcrete

applications

Fibermesh® fibres work great under pressure. Shotcrete, or pneumatically sprayed concrete, has been used since the early 1900s. There are two basic shotcreting methods. In the dry process, water is added under pressure to the cement /aggregate mixture at the nozzle of the spray gun. The wet process uses plastic concrete that is pumped through the conveying hose to the spray gun. Fibermesh fibres improve both wet and dry shotcrete methods.



Fibermesh® fibres enhance shotcrete performance

- ◆ Faster buildup
- ◆ Less rebound
- ◆ Reduce sag and scatter in slope, vertical and overhead applications
- ◆ Make hardened shotcrete tougher and more resistant to spalling, impact and thermal shock
- ◆ Inhibit plastic shrinkage cracking
- ◆ Increase fatigue resistance
- ◆ Chemically inert; will not corrode
- ◆ Provide three-dimensional secondary reinforcement
- ◆ Alternative system to nonstructural welded wire fabric
- ◆ Alkaliproof
- ◆ Safe and easy to use
- ◆ Imparts explosive spalling resistance

elevated slab

applications

Composite metal decks are often used in steel frame structures to create multilevel floor systems. The use of welded wire fabric with metal decking has always been problematic because positioning the mesh is often difficult, labour intensive and potentially dangerous for workers. Fibermesh® reinforced concrete is an alternative construction system to welded wire fabric and provides safer, crack resistant concrete.

Load tests and headed stud shear connector strength tests conducted by structural engineers have proven that Fibermesh fibres are equal or better than welded wire fabric. The tests show Fibermesh fibres may be substituted for welded wire fabric in composite beams with no difference in load-bearing capacity and no change in shear connector design.



With Fibermesh® fibres, construction workers no longer have to worry about the hassles and potential dangers associated with welded wire fabric in composite metal decks.

Use Fibermesh® fibres in these composite metal deck applications

- ◆ Bridges
- ◆ Shopping centers
- ◆ Office buildings
- ◆ Parking structures
- ◆ Schools
- ◆ Home construction
- ◆ Elevated walkways



If your business is producing dry cast or wet cast concrete precast products, it's our business to help you make better products more profitably. By using customized fibre reinforcement from the Fibermesh® family of products you can take advantage of superior engineered polypropylene fibres. Fibermesh fibres are uniformly distributed throughout precast concrete, providing multidirectional concrete reinforcement along with excellent impact resistance, abrasion resistance and improved ductility. And with Harbourite® specialty fibres, your production problems are also greatly reduced.



Precast products reach a higher level of quality with Harbourite® specialty fibres

- ◆ Septic tanks
- ◆ Agricultural products
- ◆ Utility structures
- ◆ Manhole cones and risers
- ◆ Marine products
- ◆ Sight amenities
- ◆ Burial vaults
- ◆ Hazardous material storage
- ◆ Statuaries



Harbourite® specialty fibres reduce many of the problems faced by the precast producer

- ◆ Slabbing
- ◆ Slumping
- ◆ Delamination
- ◆ Lack of cohesiveness
- ◆ Out of round bells and spigots
- ◆ Production damage
- ◆ Handling stresses
- ◆ Transportation to curing room damage
- ◆ Plastic shrinkage cracking
- ◆ Shipping damage
- ◆ Patching material
- ◆ Waste
- ◆ Production inefficiency
- ◆ Production and transport of steel

overlay/slip form

applications



Restore deteriorated asphalt with ultra-thin whitetopping

- ◆ City streets and intersections
- ◆ Local or low-volume roads
- ◆ Parking areas
- ◆ Taxiways
- ◆ Airport aprons

Concrete bridge deck overlays and parking areas designed for light commercial and residential traffic resist normal wear and impact damage with **Fibermesh®** fibres. Our fibres inhibit the formation of plastic and settlement cracking. The service life of these fibre reinforced structures is increased while reducing maintenance costs.

Ultra-thin whitetopping (UTW) overlays rehabilitate deteriorated asphalt pavement. By placing 50-100mm of **Fibermesh** reinforced concrete overlay on asphalt pavement with sufficient structure but a poor or rutted surface, your project will benefit from the long life and superior performance characteristics of concrete pavement at a cost competitive with ordinary asphalt overlays. In addition, UTW mix designs can be placed using conventional paving equipment and handle traffic less than 24 hours after construction.

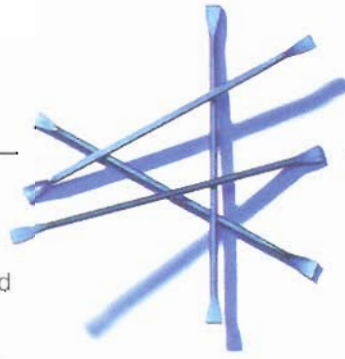


Do away with hassles at the job site. By using **Fibermesh® fibres, your slip forming project can be done better and faster**

Fibermesh® fibres are ideal for a variety of slip forming applications

- ◆ Highway barrier walls
- ◆ Street curbs
- ◆ Concrete edging
- ◆ Concrete walls
- ◆ Bridge walls

Fibermesh fibres are the ideal addition to your slip forming projects. Easy to mix into the concrete, **Fibermesh** fibres save you time and the additional labour costs associated with other secondary reinforcement products. Our polypropylene fibres give concrete a three-dimensional reinforcement system that is always placed correctly, providing impact resistance and reducing plastic and settlement crack formation.



SI Concrete Systems is a worldwide leader in the design and manufacturing of steel fibre reinforcing products for concrete.

Our long-term commitment to providing superior concrete solutions for our clients has led us to develop the most technologically advanced concrete reinforcing products and optimal mix designs available. Our range of Novocon® steel fibres have been proven to be a superior means of reinforcing concrete.

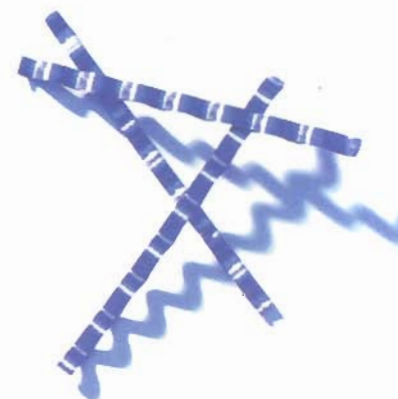
Novocon steel reinforcement proven in use

- ◆ Shotcrete for linings, stabilization, restoration and sewer rehabilitation
- ◆ Heavy industrial flooring
- ◆ Commercial flooring
- ◆ Composite metal decks
- ◆ Overlays
- ◆ Airport runways and taxiways
- ◆ Highway pavement
- ◆ Precast products
- ◆ Blast-resistant structures
- ◆ Joint-free concrete design
- ◆ Structural design
- ◆ Seismic design
- ◆ Hydrodynamic structures
- ◆ Equipment foundations

All Novocon steel fibres are ASTM A820 compliant and meet strict standards for tensile strength. Each fibre is specifically designed to meet or exceed the performance and economical expectations of Novocon's customers. The unique geometry of each Novocon steel fibre provides exceptional technical performance while maintaining excellent mixing and placement attributes.

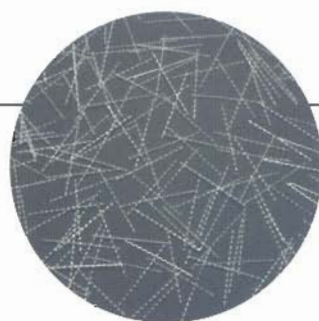
Novocon steel fibres have been engineered to provide uniform distribution throughout the concrete. There is no need for special collating of the fibre or separation equipment to ensure proper dispersion in either ready-mixed concrete or shotcrete. Novocon's proprietary fibre designs are specifically engineered for easy mixing, placement and finishing.

For strong, lasting concrete performance, turn to Novocon, backed by the Fibermesh Division of SI Concrete Systems, and unleash the power of steel fibres.



Introducing

HPP - High Performance Polymer Fibre Reinforcement



High Performance Polymer (HPP) fibres, another innovative material developed by SI Concrete Systems, are manufactured as coarse/macro filaments with an engineered contoured profile. The wave-like shape of each fibre serves to effectively anchor the fibres into the concrete, thus resisting matrix pull-out and enhancing concrete's performance even after it has developed stress cracks.

Another important feature is that the coarseness of HPP allows it to be mixed into concrete at much higher dosage rates, resulting in performance levels which extend beyond those achieved using secondary reinforcement.

This innovative product adds toughness and ductility to hardened concrete providing added resistance to dynamic loading, impact and flexural fatigue. It is non-corrosive and can be considered, in many applications, as an alternative to steel fibre reinforcement.

Contact your local representative for more details of this exciting new product



SI Concrete Systems products are manufactured to stringent international ISO 9002 standards for quality and consistency. We were one of the first companies in the U.S. to receive ISO 14001 certification for complying with internationally recognized environmental standards.



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