

# SikaFiber® PRODUCT TECHNOLOGY

## FIBER TYPE

The first step to choosing the right fiber is to understand the type of fiber required for your application. The main standards for fiber reinforced concrete are ASTM C 1116 and EN14889. ASTM C 1116, Standard Specification for Fiber Reinforced Concrete, outlines four (4) classifications of fiber reinforced concrete;

- Type I – Steel fiber-reinforced concrete or shotcrete (ASTM A820)
- Type II – Glass fiber-reinforced concrete or shotcrete (ASTM C1666)
- Type III – Synthetic fiber-reinforced concrete or shotcrete (Polypropylene ASTM D7508)
- Type IV – Natural Fiber-reinforced concrete or shotcrete (ASTM D7357)

## FIBER REINFORCED CONCRETE

Micro fibers have a diameter that is less than 0.3 mm. Micro fibers are either monofilament or fibrillated. Micro fibers should be used for plastic shrinkage control (cracking that can occur in the first 24 hours of concrete cure), impact protection, and reduction of explosive

spalling during a fire. The fibrillated micro fibers are often used in replacement of the lightest welded wire fiber (6x6 W1.4/W1.4) for temperature and shrinkage characteristics.

Structural macro fibers have a diameter greater than 0.3 mm. Macro fibers are used as a replacement for temperature and shrinkage reinforcement (WWF) or as structural reinforcement in concrete or shotcrete. Macro fibers are used where an increase in residual (post-cracking) flexural strength is required (ASTM C1609 or EN14845).

## FIBER PERFORMANCE

Macro fiber performance is influenced by three characteristics; tensile strength, aspect ratio (calculated as the length/diameter) and anchorage (hooked, crimp, emboss, fibrillation, etc.). One characteristic does not outweigh another; all three items have to work together for optimal performance. Fiber reinforced concrete is a composite material and therefore, all fibers are tested in the concrete to prove their performance.

Steel fibers may be collated (glued) together in a clip. The collation of the fibers does not improve performance of the fiber reinforced concrete. Collated fibers improve the ease of mixing of high aspect ratio fibers. Collated fibers are added to the concrete mix, the bundles are spread throughout the concrete. Continued mixing action breaks apart the clips to let the individual fibers separate quickly throughout the mix. In the same vein, synthetic macro fibers can be in a wrapped bundle or puck. The fiber wrapping is degradable and will disperse during mixing.

Fibers begin to function in a structural supportive manner when the concrete matrix starts to crack, just like traditional reinforcement. The crack has to occur for the load to switch from the concrete to the reinforcement. The fibers then provide ductility and support by bridging cracks and thus providing post crack strength to the concrete.



## BEST USE OF THE DIFFERENT TYPES OF FIBERS

State of concrete or mortar	Effect / property improvement	Recommended fiber type
Fresh	Reduce Rebound of Shotcrete	Micro-PP fibers
Fresh	Homogeneity improvement	Micro-PP fibers
Up to 24 Hours	Early-age cracking reduction	Micro and Macro-PP fibers
28 days hardening or more	Improvement of explosive spalling	Micro-PP fibers
1-2 days	Reduction of cracks induced by restraint or temperature	Micro & Macro-PP fibers
28 days hardening or more	Transmission of external forces	Macro-PP & Steel fibers

PP = Polypropylene Synthetic Fibers

# SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:



WATERPROOFING



CONCRETE



REFURBISHMENT



SEALING AND BONDING



FLOORING



ROOFING

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The sale of all Sika products are subject to the following Limited Warranty:

### LIMITED MATERIAL WARRANTY

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor.

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Our most current General Sales Conditions shall apply. Please consult the Product Data Sheets prior to any use and processing.

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# CONCRETE SikaFiber® PRODUCT GUIDE

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# SikaFiber® PRODUCT TECHNOLOGY



Fibers are an ideal ingredient for use in concrete and mortars as a method for improving these materials where they may otherwise have weaknesses. Micro concrete fibers can reduce plastic shrinkage cracking, settlement cracking, and improve explosive fire spalling resistance. Macro concrete fibers reduce shrinkage crack formation and crack widths whilst also increasing performance in energy absorption and toughness. Additional benefits such as reduction or elimination of reinforcing steel and increased durability can also be seen. In addition, the use of fiber reinforced concrete, over rebar and wire mesh, leads to faster and safer concrete installations.

Fiber Reinforced Concrete (FRC) is not a new concept. Since biblical times fibers were used in cementitious construction materials in the form

of straw and horse hair. Today, there is a large variety of fiber options for reinforcing concrete, such as micro and macro synthetic fibers, steel fibers and fiber blends. With so many options it can be difficult to determine exactly what fiber is required for a given application. Examples of common applications utilizing FRC include ground-supported slabs, composite metal decks, mat slabs, pavements, bridge decks, tunnel segments, shotcrete and various precast applications.

In 2018, Sika® acquired the global Concrete Fibers business from Propex Holding, LLC, which included a US plant manufacturing synthetic fibers for use in concrete reinforcement, sales operations across Sika's geographical regions, and Fibermesh®, a strong brand in FRC. The acquired business was the perfect addition to

Sika's concrete admixture product lines making Sika® a true single source supplier for all ready mix and precast concrete applications. With the addition of Fibermesh®, Novomesh®, Novocon®, and Enduro® to Sika's product portfolio, Sika® can better supply the needs of concrete customers, engineers, general contractors, owners, and architects.

#### KEY FRC BENEFITS

- Reduced incidence of early age plastic shrinkage cracking
- Improved load capacity and ductility
- Protection against freeze-thaw cycles
- Better cohesion in the fresh concrete
- Increased abrasion resistance
- Higher flexural and shear strengths
- Reinforcement replacement
- Joint Extension

# CHARACTERISTICS, BENEFITS & APPLICATION GUIDES

## SikaFiber® CHARACTERISTICS GUIDE

Type	Products	Length, "	Dosage, lbs/cu.yd	Standards	Description
<b>ACRYLIC</b>	Sika Fibermesh® AC 100	Graded	0.5 - 1	ASTM C1116 - Type III	Micro Monofilament Acrylic Fiber, Degradable Bags
<b>NYLON</b>	Sika Fibermesh® FN	0.5", 0.75"	1	ASTM C1116 - Type III	Micro Monofilament Nylon Fiber, Degradable Bags
<b>MICRO</b>	Sika Fibermesh® 500	Graded	1.5	ASTM D7508	Polypropylene Monofilament or Fibrillated Degradable Bags
	Sika Fibermesh® HP	Graded	0.5	ASTM D7508	Polypropylene Monofilament, Fine Denier, Degradable Bags
	Sika Fibermesh® 150	Graded	1	ASTM D7508	Polypropylene Monofilament, Degradable Bags
	Sika Fibermesh® 300e3	Graded	1.5	ASTM D7508	Polypropylene Fibrillated, Degradable Bags
<b>MACRO</b>	Sika Fibermesh® 150F	0.25" or 0.5"	1 - 3.4	ASTM D7508	Polypropylene Monofilament, Degradable Bags
	Sika Fibermesh® 650	Graded	3 - 7	ASTM D7508	Structural, Polypropylene, In Pucks
	SikaFiber® 800 Stealth	1.5"	3 - 7	ASTM D7508	Structural, Crimped, Polypropylene, In Pucks
	SikaFiber® Enduro® Prime	2.2", 2.4"	3 - 7	ASTM D7508	Structural, Crimped, Polypropylene, In Pucks
	SikaFiber® 54 Force	2"	3 - 11	ASTM D7508	Structural Embossed Polypropylene, In Pucks
	Sika Fibermesh® 650S	Graded	5 - 8.5	ASTM D7508	Structural, Polypropylene, In Pucks
<b>STEEL</b>	Sika Fibermesh® 665	2.6"	5 - 9	ASTM D7508	Structural, Polypropylene, In Pucks
	SikaFiber® Novocon® XR	1.5", 2"	25 - 66	ASTM A820 - Type V	Steel, Crimped, 25 lb Repulpable Bags
	SikaFiber® Novocon® CS 1000	1"	20 - 75	ASTM A820 - Type II	Steel Fiber, 55 lbs Boxes
	SikaFiber® Novocon® HE4550	2"	25 - 67	ASTM A820 - Type I	Steel, Hooked End, 44 lb Paper Bags
	SikaFiber® Novocon® CHE6560	2.4"	24 - 67	ASTM A820 - Type I	Steel, Collated Hooked End, 44 lb Paper Bags
	SikaFiber® Novocon® CHE8060	2.4"	25 - 67	ASTM A820 - Type I	Steel, Collated Hooked End, 44 lb Paper Bags
<b>BLEND</b>	SikaFiber® Novocon® CHE6535	1.4"	35 - 80	ASTM A820 - Type I	Steel, Collated Hooked End, 44 lb Paper Bags
	SikaFiber® Novomesh® 850	1.5"	24-48	A820 Type V & C1116 Type III	Steel-Synthetic Blend, 24 lb Degradable Bags
	SikaFiber® Novomesh® 950	1.9"	5 - 10	ASTM D7508	Macro-Micro Synthetic Blend, 5 lb Bags

## SikaFiber® APPLICATION GUIDE

Concrete fibers have an innumerable amount of applications in concrete construction. Not only will benefits in fresh and hardened properties be seen, secondary benefits will be made as well. By reducing or replacing traditional meshes and steel reinforcement, labor costs will be reduced and construction schedules can be accelerated. Safety is increased by reducing the chances of tripping or impalement by traditional steel reinforcement. With concrete fiber being integral (well mixed) throughout the concrete, there is no opportunity for reinforcement to end up in the bottom of your slab.

#### KEY APPLICATION BENEFITS:

- Integral Reinforcement
- Increased safety
- Less opportunities for callbacks
- Long term durability increase
- Reduction in labor for placement of reinforcement

## SikaFiber® PERFORMANCE BENEFITS GUIDE

Type	Products	Early Age Benefits			Long Term Benefits										
		Reduces Plastic Shrinkage Cracking	Reduces Plastic Settlement Cracking	Improves Cohesion	Reduces Explosive Spalling During Fire	Provides Post First Crack Reinforcement	Provides Shatter & Impact Resistance	Provides Restrained Shrinkage Crack Control	Flexural Toughness for Shotcrete	Extends Joint Spacing	Greater Fatigue Resistance	Greater Ductility	Reduces Water Penetration		
<b>ACRYLIC</b>	Sika Fibermesh® AC 100	•	•	•			•								•
<b>NYLON</b>	Sika Fibermesh® FN	•	•	•			•								•
<b>MICRO</b>	Sika Fibermesh® HP	•	•	•			•								•
	Sika Fibermesh® 150	•	•	•			•								•
	Sika Fibermesh® 300e3	•	•	•		•	•								•
<b>MACRO</b>	Sika Fibermesh® 150F	•	•	•	•		•								•
	Sika Fibermesh® 650	•	•	•		•	•	•							•
	SikaFiber® 800 Stealth	•	•	•		•	•	•							•
	SikaFiber® Enduro® Prime	•	•	•		•	•	•							•
	SikaFiber® 54 Force	•	•	•		•	•	•	•						•
	Sika Fibermesh® 650S	•	•	•		•	•	•	•						•
<b>STEEL</b>	Sika Fibermesh® 665	•	•	•		•	•	•							•
	SikaFiber® Novocon® XR						•	•	•	•					•
	SikaFiber® Novocon® CS 1000						•	•	•						•
	SikaFiber® Novocon® HE4550						•	•	•						•
	SikaFiber® Novocon® CHE6560						•	•	•						•
	SikaFiber® Novocon® CHE8060						•	•	•						•
<b>BLEND</b>	SikaFiber® Novocon® CHE6535						•	•	•						•
	SikaFiber® Novomesh® 850	•	•	•			•	•	•						•
	SikaFiber® Novomesh® 950	•	•	•			•	•	•						•

		Slabs						Pavements			Composite Metal Deck	Precast				Shotcrete & Underground	
		Residential/Light Commercial	Commercial	Industrial	Heavy Industrial	Extended Joint	Overlays	Parking Areas & Roadways	Overlays	Sidewalk		Tunnel Segments	Vaults Tanks & Containers	Pipe	Wall & Tilt-Up	Tunneling & Mining	Slope Stabilization
<b>ACRYLIC</b>	Sika Fibermesh® AC 100	•	•	•	•		•										
<b>NYLON</b>	Sika Fibermesh® FN	•		•	•												
<b>MICRO</b>	Sika Fibercast® 500			•	•											•	•
	Sika Fibermesh® HP	•	•	•	•												
	Sika Fibermesh® 150	•	•	•	•												
	Sika Fibermesh® 300e3	•															
<b>MACRO</b>	Sika Fibermesh® 150F																
	Sika Fibermesh® 650	•	•														
	SikaFiber® 800 Stealth	•	•														
	SikaFiber® Enduro® Prime			•	•												
	SikaFiber® 54 Force																
	Sika Fibermesh® 650S																
<b>STEEL</b>	Sika Fibermesh® 665																
	SikaFiber® Novocon® XR		•								•						
	SikaFiber® Novocon® CS 1000		•	•		•	•										
	SikaFiber® Novocon® HE4550			•													
	SikaFiber® Novocon® CHE6560			•	•												
	SikaFiber® Novocon® CHE8060				•												
<b>BLEND</b>	SikaFiber® Novocon® CHE6535																
	SikaFiber® Novomesh® 850	•	•	•													
	SikaFiber® Novomesh® 950	•	•	•													

