



# CONCRETE

## SikaFiber® PRODUCT SELECTION GUIDE

# SikaFiber®

## PRODUCT TECHNOLOGY

### FIBER BACKGROUND

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, UHPC and various precast applications.

In 2018, Sika® acquired Fibermesh®, which included a US plant manufacturing synthetic fibers for use in concrete reinforcement, and sales operations across Sika's geographical regions. Sika's fiber portfolio include the following products; Fibermesh®, Novomesh®, Novocon®, Enduro® and SikaFiber®.

### 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 C1116/C1116M, 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 improved permeability. Specialty monofilament fibers can be utilized to reduce the occurrence 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 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 twisted or pucked. The fiber wrapping is degradable and the fibers 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 transfer 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.





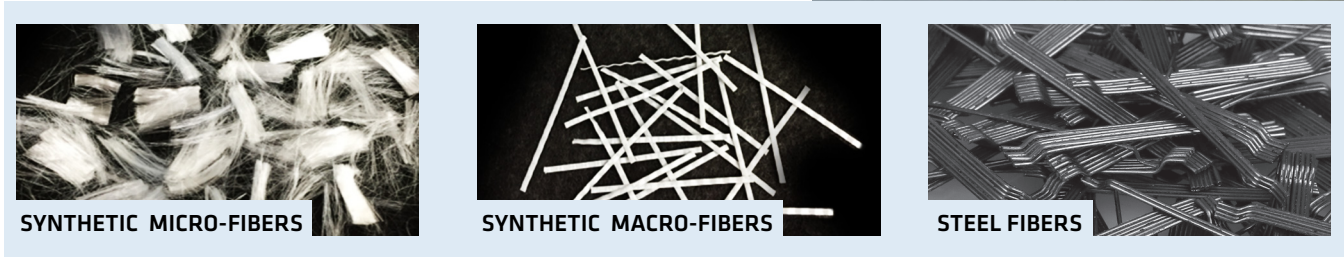
BEST USE OF THE DIFFERENT TYPES OF FIBERS

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

SUSTAINABILITY

A strategy for reducing project eCO2 is looking for opportunities to substitute products or materials with high eCO2 for those with lower eCO2 without adversely impacting the design intent or durability. One such example exists with the partial or complete replacement of steel reinforcement in slabs on ground or in composite metal decks with macro synthetic fiber reinforced concrete. Steel reinforcement is also a major contributor to eCO2 with 1.1 pounds of CO2 emitted for every one (1) pound produced. Synthetic fiber reinforcement can replace traditional reinforcement and enhance the overall performance, quality, and sustainability of the slab.



# 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® Fibercast® 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® 300	Graded	1.5	ASTM D7508	Polypropylene Fibrillated, Degradable Bags
	Sika® Fibermesh® 150F	0.25" or 0.5"	1 - 3.4	ASTM D7508	Polypropylene Monofilament, Degradable Bags
<b>MACRO</b>	Sika® Fibermesh® 650	Graded	3 - 7	ASTM D7508	Structural Polypropylene, In Pucks
	SikaFiber® 800 Stealth	2"	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® Force 48 or 54	1.9", 2"	5 - 17	ASTM D7508	Structural Embossed Polypropylene, In Pucks
	Sika® Fibermesh® 650S	Graded	5 - 8.5	ASTM D7508	Structural, Polypropylene, In Pucks
	Sika® Fibermesh® 665	2.6"	5 - 9	ASTM D7508	Structural, Polypropylene, In Pucks
<b>STEEL</b>	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"	15 - 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
	SikaFiber® Novocon® CHE6535	1.4"	35 - 80	ASTM A820 - Type I	Steel, Collated Hooked End, 44 lb Paper Bags
	SikaFiber®-7020 UHPC	3/4"	*	ASTM A820 - Type I	UHPC Steel Fiber 44 lb Paper Bags
	SikaFiber®-6513 UHPC	1/2"	*	ASTM A820 - Type I	UHPC Steel Fiber 44 lb Paper Bags Conforms to Buy America Act
<b>BLEND</b>	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

\* Dosage based on application



# 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	Strain Hardening
ACRYLIC	Sika® Fibermesh® AC 100	•	•	•			•						•	
NYLON	Sika® Fibermesh® FN	•	•	•			•						•	
MICRO	Sika® Fibermesh® HP	•	•	•			•						•	
	Sika Fibermesh® 150	•	•	•			•						•	
	Sika® Fibermesh® 300	•	•	•		•	•				•		•	
	Sika® Fibermesh® 150F	•	•	•	•		•						•	
MACRO	Sika® Fibermesh® 650	•	•	•		•	•	•			•	•	•	
	SikaFiber® 800 Stealth	•	•	•		•	•	•		•	•	•	•	
	SikaFiber® Enduro® Prime	•	•	•		•	•	•		•	•	•	•	
	SikaFiber® Force 48 or 54	•	•	•		•	•	•	•		•	•	•	
	Sika® Fibermesh® 650S	•	•	•		•	•	•	•		•	•	•	
	Sika® Fibermesh® 665	•	•	•		•	•	•	•		•	•	•	
STEEL	SikaFiber® Novocon® XR			•		•	•	•	•	•	•	•		
	SikaFiber® Novocon® CS 1000			•		•	•	•		•	•	•		
	SikaFiber® Novocon® HE4550			•		•	•	•		•	•	•		
	SikaFiber® Novocon® CHE6560			•		•	•	•		•	•	•		
	SikaFiber® Novocon® CHE8060			•		•	•	•			•	•		
	SikaFiber® Novocon® CHE6535			•		•	•	•	•		•	•		
	SikaFiber®-7020 UHPC			•			•	•			•	•		•
	SikaFiber®-6513 UHPC			•			•	•			•	•		•
BLEND	SikaFiber® Novomesh® 850	•	•	•		•	•	•		•	•	•		
	SikaFiber® Novomesh® 950	•	•	•		•	•	•		•	•	•	•	



# CHARACTERISTICS, BENEFITS & APPLICATION GUIDES

## SikaFiber® APPLICATION GUIDE

		Slabs						Pavements		
		Residential/ Light Commercial	Commercial	Industrial	Heavy Industrial	Extended Joint	Overlays	Parking Areas & Roadways	Overlays	Sidewalk
ACRYLIC	Sika® Fibermesh® AC 100	•	•	•	•					
NYLON	Sika® Fibermesh® FN	•		•	•				•	•
MICRO	Sika® Fibercast® 500									
	Sika® Fibermesh® HP	•	•	•	•			•		
	Sika® Fibermesh® 150	•	•	•	•			•		•
	Sika® Fibermesh® 300	•					•	•	•	•
	Sika® Fibermesh® 150F									
MACRO	Sika® Fibermesh® 650	•	•				•		•	•
	SikaFiber® 800 Stealth	•	•	•		•	•	•	•	•
	SikaFiber® Enduro® Prime			•	•	•	•			
	SikaFiber® Force 48 or 54									
	Sika® Fibermesh® 650S									
	Sika® Fibermesh® 665									
STEEL	SikaFiber® Novocon® XR		•					•		
	SikaFiber® Novocon CS 1000		•	•		•	•			
	SikaFiber® Novocon® HE4550			•						
	SikaFiber® Novocon® CHE6560			•	•					
	SikaFiber® Novocon® CHE8060				•					
	SikaFiber® Novocon® CHE6535									
	SikaFiber®-7020 UHPC									
	SikaFiber®-6513 UHPC									
BLEND	SikaFiber® Novomesh® 850	•	•	•			•	•		
	SikaFiber® Novomesh® 950	•	•	•			•	•	•	•

## 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 mesh 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
  - Decreased placement schedule

		Composite Metal Deck	Precast				Shotcrete & Underground		UHPC
			Tunnel Segments	Vaults Tanks & Containers	Pipe	Wall & Tilt-Up	Tunneling & Mining	Slope Stabilization	
ACRYLIC	Sika® Fibermesh® AC 100								
NYLON	Sika® Fibermesh® FN								
MICRO	Sika® Fibercast® 500			•	•		•	•	
	Sika® Fibermesh® HP			•	•	•			
	Sika® Fibermesh® 150				•	•	•		
	Sika® Fibermesh® 300								
	Sika® Fibermesh® 150F		•				•		
MACRO	Sika® Fibermesh® 650	•							
	SikaFiber® 800 Stealth	•		•					
	SikaFiber® Enduro® Prime	•	•	•	•	•			
	SikaFiber® Force 48 or 54						•	•	
	Sika® Fibermesh® 650S				•			•	
	Sika® Fibermesh® 665						•		
STEEL	SikaFiber® Novocon® XR	•						•	
	SikaFiber® Novocon CS 1000					•			
	SikaFiber® Novocon® HE4550								
	SikaFiber® Novocon® CHE6560			•		•			
	SikaFiber® Novocon® CHE8060		•						
	SikaFiber® Novocon® CHE6535			•	•		•	•	
	SikaFiber®-7020 UHPC								•
	SikaFiber®-6513 UHPC								•
BLEND	SikaFiber® Novomesh® 850								
	SikaFiber® Novomesh® 950								



# SIKA FULL RANGE SOLUTIONS FOR CONSTRUCTION:



**WATERPROOFING**



**CONCRETE**



**REFURBISHMENT**



**SEALING AND BONDING**



**FLOORING**



**ROOFING**

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**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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Please consult the Product Data Sheets prior to any use and processing.

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