

### PURPOSE:

To explain the “invisible” nature of Solomon UltraFiber 500<sup>™</sup> concrete reinforcing fibers and to demonstrate two methods for verifying the presence of the fiber in the mix at the jobsite.

### “INVISIBLE” NATURE:

Solomon UltraFiber 500<sup>™</sup> (UF-500) is a very different concrete reinforcing fiber compared to synthetic fibers being used in the concrete industry. One unique characteristic of UF-500 fibers is they are difficult to see with the human eye in plastic or hardened concrete.

The reason that UltraFiber 500<sup>®</sup> is difficult to see is directly related to its physical properties. The table below compares properties of UltraFiber 500<sup>®</sup> to a typical polypropylene fiber which is visible in plastic and hardened concrete:

Property	UltraFiber 500 <sup>®</sup>	Typical Polypropylene
Avg. Fiber Length	2.3 mm	15.9 mm
Avg. Fiber Denier	2.5 g/9,000m	5.8 g/9,000m
Average Fiber Diameter	18 μm	30 μm
Bonding w/Cement Paste	Extensive	Almost None
Max. Water Up-Take (% of fiber weight)	85%	0%
Accepts Pigments	YES	NO

UltraFiber 500<sup>®</sup> fibers are shorter, smaller in diameter, and have a lower denier than most synthetic fibers. UltraFiber 500<sup>®</sup> fibers become completely coated with cement paste during the concrete mixing process and absorb a small amount of water containing dissolved cement particles. As the concrete begins to hydrate, the cement paste hardens and bonds to the fiber. As a result, UltraFiber 500<sup>®</sup> will quickly take on a gray coloring (or the color of any pigment being used) making it unrecognizable as fiber in a wet mix. In contrast, polypropylene fibers absorb no water, have virtually no bonding with cement paste, and will remain very white on their surface. The lack of absorbency and bonding are why polypropylene fibers remain so visible in plastic concrete. On a finished surface (for example broom or steel trowel finish), UltraFiber 500<sup>®</sup> is virtually unnoticeable to the naked eye. Polypropylene fibers, however, visibly protrude from hardened surfaces and are quite often observed as “fiber balls” or “fuzz” throughout the hardened surface.

The “invisible” nature of UltraFiber 500<sup>®</sup> make it an ideal concrete reinforcing fiber because it can provide the much needed performance for crack control and durability without leaving an aesthetically offensive appearance to the finished concrete. These attributes of UltraFiber 500<sup>®</sup> are extremely important and beneficial to finishers who must “sell” the finish on either conventional or decorative flat work. See Solomon Technical Bulletin #2 for more information on the finishing benefits of UltraFiber 500<sup>®</sup>.

## "SEEING" THE FIBERS:

The beneficial invisible nature of Solomon UltraFiber 500™ presents a challenge. Customers often need visual verification at the job site that the fiber they requested is in the mix. There are two simple procedures that can be done quickly at any jobsite to visually verify the presence of UltraFiber 500® fibers.

Method A: This method requires no tools or materials to perform. As the concrete is being poured and placed, pick up a small handful that has been screeded off the form edges or dropped on the ground at the site. Let this concrete dry for about 15 to 45 minutes (time required is dependant on weather conditions and mix type). As it dries and begins to harden, the water is being drained from the fiber due to the aggressive hydration reactions. The water draining from the fiber causes the fiber to become less flexible and more rigid. Once the concrete piece is adequately hardened, break it open and numerous tiny fibers will be visibly protruding from the broken surface confirming the presence of UltraFiber 500® in the mix. Heating the small concrete sample can speed the time required for it to dry adequately (for example: placing it in direct sunlight, putting the sample near a hot vehicle exhaust, laying it across hot air from vehicle defroster vents, etc.).



**Allow some concrete pieces to partially dry**



**Break the pieces open**



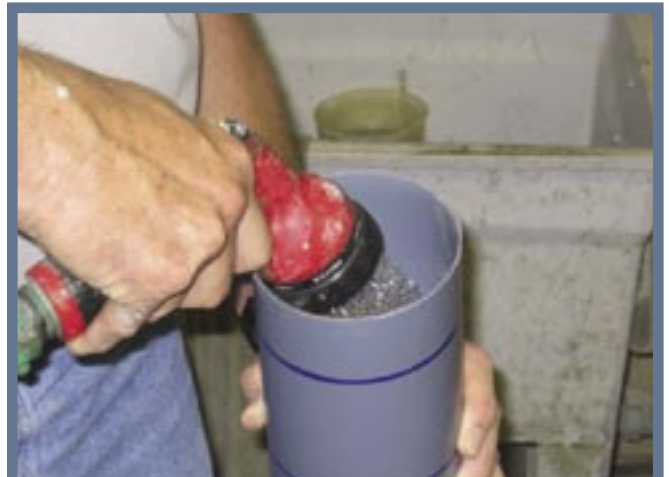
**The very small UltraFiber 500® fibers can be seen protruding across the broken edge**

**Method B:** This approach can easily be done in minutes and requires only a couple of commonly available items. Obtain a small container with lid (cylinder mold works well) and a fine mesh filter screen (tea strainer for example). The procedure is:

1. Fill the container about 1/3 full with fresh concrete discharged from the truck.
2. Add water to the container until about 80% full.
3. Cap the container and shake vigorously for about 20 seconds.
4. Quickly remove the lid, wait about 10 seconds (to let fine sand particles settle), then pour the liquid portion over the mesh screen. If the water begins to drain slowly, use your finger to loosen the solids collecting on the screen so all the remaining water can pass through.
5. Once the water is completely drained, the UltraFiber 500<sup>®</sup> fibers will form a visible light grey colored mat on the screen. Pour clean water over the fibers for a better view.



**Put some fresh concrete in a container**



**Add water to the container**



**Cap the container, shake for 20 seconds**

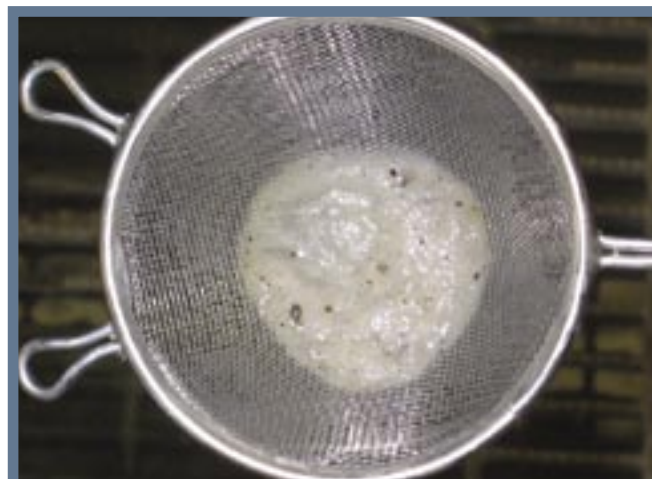


**Pour the liquid portion over the screen**





**A visible fibrous mat will form**



**Fiber is more concentrated and whiter after additional water rinsing**

The added dilution water combined with the agitation causes the dispersed UltraFiber 500<sup>®</sup> fibers to get caught up into the dilute liquid portion.

In fully cured and hardened concrete, UltraFiber 500<sup>®</sup> fibers are almost impossible to see with the naked eye. The extensive bonding between the fiber surface and the hydrated cement is so strong the fibers are disguised within the paste matrix. If hardened concrete is broken, fibers across the break will be visibly protruding. The only 100% certain way to identify the presence of UltraFiber 500<sup>®</sup> in fully cured concrete is using microscopy.

#### **Summary:**

The physical attributes of Solomon UltraFiber 500<sup>™</sup> concrete reinforcing fiber leave it virtually “invisible” in concrete (plastic or hardened). This unique feature eliminates any aesthetic quality concerns for incorporating Ultra Fiber 500<sup>®</sup> into any application ranging from standard broom or trowel finish flat work to high-end decorative concrete.

When contractors or ready mix producers need immediate confirmation for their customers that these revolutionary fibers are present in the concrete during placement, these two simple methods are available and can be easily and reliably done at the jobsite to visually verify the fiber presence.