# Buckeye Technical Bulletin

## A Comparison of UltraFiber 500® to Various Macro Fibers

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### Preliminary Conclusions:

- UltraFiber 500 was much easier to finish than any of the macro fibers
- UltraFiber 500 produced a superior slab finish vs. the macro fibers
- UltraFiber 500 provided the same compressive strength as the macro fibers at 56 days
- UltraFiber 500 has provided the same level of shrinkage crack control as the macro fibers at 90 days age in a dry environment
- UltraFiber 500 provides a greater value to the customer vs. macro fibers

UltraFiber 500 provides crack control while also providing superior finish-ability in comparison to the longer macro fiber.

### Testing Purpose:

To compare the impact to the reduction of cracking due to shrinkage of concrete slabs on grade when placed with Buckeye UltraFiber 500 concrete reinforcing fibers and synthetic macro fibers. Macro fibers are longer in length (1.5" minimum) than typical micro synthetic fibers. Manufactures promote macro fibers to help control long term drying shrinkage. UltraFiber 500 is a reinforcing fiber that relies on bond of the fiber to the cement paste to impart reinforcement of the concrete and shrinkage control. Synthetic fibers rely on embedment length of the fibers for reinforcement of the concrete.

Placement of the Concrete Slabs

Slabs after Removal of Forms

### Testing Methodology:

In order to test the various concrete reinforcing fibers, 8 long narrow concrete slabs measuring 3' X 70' each were placed to measure drying shrinkage of the concrete over time. The slabs are 5.5 inches thick. Four different reinforcing fibers were used in the concrete at a dosage rate of 4.0 $lb/y^3$ to compare the crack performance of the various fibers.

The fibers included Buckeye UltraFiber 500, Forta Ferro, Propex 650 and W.R. Grace Strux 90/40. Two slabs were place with each type of fiber. The slabs were placed in Reno, Nevada on the plant site of local Ready Mix producer. Reno was chosen as the test site due to the extremely dry conditions which promotes shrinkage and cracking of concrete. The concrete mix design used was one commonly used by the producer on many local industrial/warehouse slab applications. The mix consisted of 6.3 sacks of cement/fly ash and a water cement ratio of 0.50. Dr. David Sanders, Professor of Civil Engineering at the University of Nevada-Reno, was present to witness and verify the batching and placement of the concrete. Dr. Sanders will take measurements and map the shrinkage cracking that takes place on a long term basis. A final report will be issued by Dr. Sanders at the conclusion of the study.

## Preliminary Report:

The concrete slabs were placed on July 9, 2009. Periodic visual inspections have been made by Dr. Sanders. The first crack was observed on July 31, 2009 in one of the slabs containing Strux 90/40 fibers. On September 11, 2009 all of the slabs had cracked around the mid-point of the slabs. The slabs containing Strux 90/40 and Forta Ferro had experienced two cracks each while the slabs with UltraFiber 500 and Propex 650 had cracked once each. Compressive strength data was released by the test lab on September 3, 2009. Testing of plastic and hardened properties of the concrete was performed by CME of Reno. Test reports are available upon request. The resulting average compressive strengths are as listed:

| | |
|---|---|
| UltraFiber 500 | 6307 psi |
| W.R. Grace Strux 90/40 | 6304 psi |
| Forta Ferro | 6225 psi |
| Propex 650 | 6422 psi |

Finishing of the slabs was also observed by Dr. Sanders during the placement. Photos of the slab finishes are shown below. UltraFiber 500 provided a superior finish to all of the macro fibers. Blemishes to the slab surfaces can be seen for all of the macro fibers.

**Buckeye UltraFiber 500**

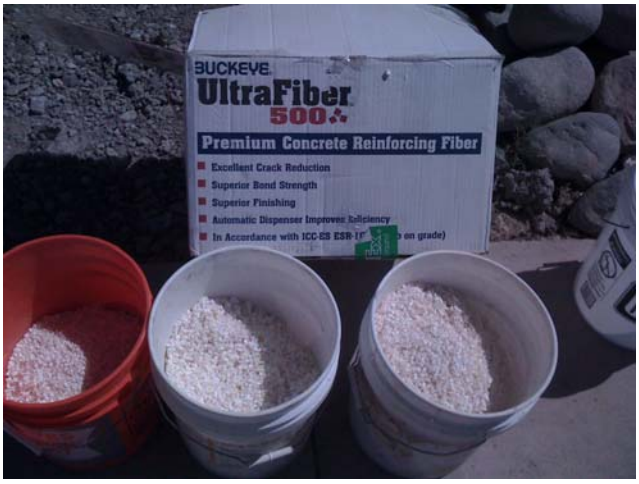
**Forta Ferro**

**Propex 650**

**W.R. Grace Strux 90/40**

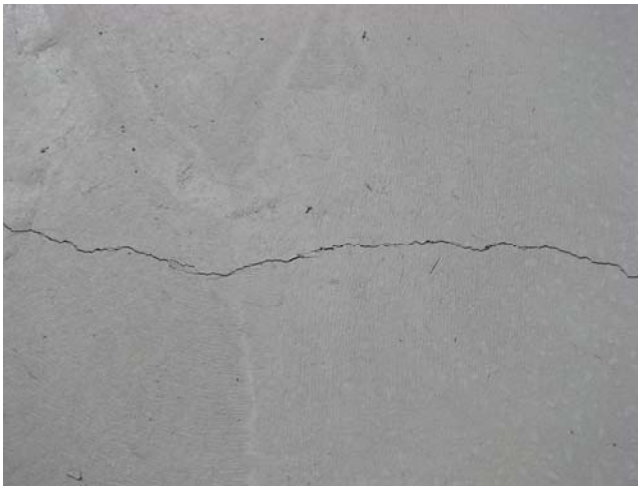
The slabs were inspected again on November 2, 2009. All of the slabs were observed to have cracked at the same rate. The crack widths were visually observed to be of similar width. Photos of each fiber type are shown below:

**Buckeye UltraFiber 500**




**Forta Ferro**


**Propex 650**



**W.R. Grace Strux 90/40**


Dr Sanders will inspect the slabs again as weather permits. The slabs will be monitored for a period of one year. Detailed crack measurements will be recorded as well as crack spacing and number of cracks for each slab. A final report will be issued by Dr. Sanders.

UltraFiber 500 may be added to concrete at a dosage rate of 1.0 to 4.0 lb/y$^3$, depending upon the application and required level of crack reduction.

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