



EUCLID CHEMICAL

## Recommended Practices for Addition of TUF-STRAND SF to Ready-Mixed Concrete

TUF-STRAND SF, a macro-synthetic fiber provided by the Euclid Chemical Company, may be used for the replacement of conventional welded wire mesh, rebar and steel fibers in slab on grade work, precast concrete and shotcrete applications. Adequate mixing time is required to properly distribute the fiber and develop the bonding characteristics and ultimate desired performance within the concrete mixture.

When adding TUF-STRAND SF to concrete, the method of addition into the concrete batch process can contribute to ensuring success in the field. In general, adding higher volumes of TUF-STRAND SF, or any macro-fiber, to a mixture that is "too dry" (slump less than 2"), whether the slump is measured before or after fiber addition, can cause fiber balling and other significant rheology problems. Adding fibers at the end of a batch cycle, after all ingredients including chemical admixtures, and accounting for anticipated slump loss, is generally recommended. However, it is also possible to add TUF-STRAND SF at other points during the batch cycle provided that other materials are quickly added and that sufficient initial slumps are achieved. A trial mixture should be performed to ensure that the concrete mixture will support the fiber type and dosage and that the batching sequence will not cause any problems. High volume fiber mixtures should include increased cementitious or fines contents. Where necessary, the use of additional chemical admixtures, such as water reducing admixtures, may be warranted to maintain the desired slump for proper placement and consolidation.

Fiber balling can occur with any type of fiber and in any type of mixture. It is not a common occurrence and often the usual root cause is having too much fiber added into a mix where the slump is reduced to an unmanageable state and fibers start clumping together. Adding water or plasticizer "after the fact" may or may not help depending on the mixture itself.

### General Recommendations for Adding Macro-Synthetic Fibers to Concrete:

1. A 5 pcy dosage can reduce slump by as much as 2". Higher slump losses can be encountered with higher dosage rates. When adding fibers into the 'tail-end' of a truck after batching, and desiring a final slump of 5" with a 5 pcy dosage, it would be recommended to produce a concrete mix, without fiber, at a slump of 7" with admixtures. Add fiber with the truck mixing at full speed if possible and mix for 5 minutes. Re-adjust with admixtures or water to get final slump.
2. If 'front loading' or adding fibers in a central mix operation; ensure all water and admixtures are introduced into the concrete mixture within a small time frame. If the fiber mixture gets too dry in middle mixing stages, fiber balling may occur. An increased slump and longer mixing time may be warranted to break up any fiber clumps. Do not hold back any initial water. Addition of fibers with coarse aggregate has also been successfully practiced.

An additional practice that may be employed after all fibers are loaded, whether front or rear-loading, is to stop the mixing truck agitation after 1 full minute of mixing and back the concrete load up to the top fin to ensure that all fibers are in the mixture and that no fiber balls are present. If no fiber clumps are visible, continue with normal mixing operations.

Other general recommendations: While TUF-STRAND SF can be mixed on-site (at job placement), there are several advantages to mixing the fibers at a plant or centralized location.

- Additional mixing time to a job-site will ensure homogeneous distribution of fibers even in situations where high slump, or low shear capacity mixing is encountered.
- Site adjustments for slump and air content can be made quickly and effectively prior to the concrete leaving the Ready-Mix plant ensuring proper compliance to specifications at time of delivery to the job site.
- For Self-Consolidating Concrete, mixtures with small sized aggregates or mixture designs with very high slump values, it may be recommended to mix TUF-STRAND SF with the coarse aggregate to promote the bonding characteristics of the fiber to be taken advantage of.

**For all applications, please refer to the TUF-STRAND SF Technical Data Sheet and MSDS for additional information. Consult your local EUCLID CHEMICAL sales representative for additional recommendations and guidance before adding TUF-STRAND SF into a concrete or shotcrete mixture.**