EUCLID CHEMICAL

Technical Bulletin Series

ECTB 10-17

Shrinkage Control Additives

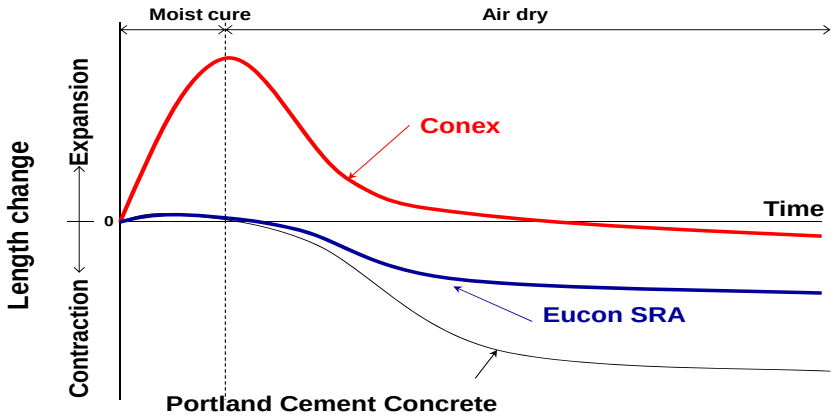
Euclid Chemical offers a number of additives to help control the shrinkage of concrete and / or compensate for it. Recently there has been some confusion or questions regarding when to use which shrinkage control additive. This technical brief has been developed to help explain the benefits of each additive and give some examples of when or how to use them.

The additives most commonly used to control shrinkage are; **EUCON SRA-XT / Floor**, **CONEX** and **Tuf-Strand SF** macro fibers.

EUCON SRA-XT / Floor are *shrinkage reducing admixtures* intended to reduce the amount of shrinkage normally experienced as concrete hydrates and dries. These types of materials use the reduction of pore water hydrostatic / surface tension to reduce the amount of stress exhibited on the wall of the capillary pores as water leaves the system. As concrete dries, the level of capillary water lowers and this action 'pulls' on the walls of the capillary pores due to the normal surface tension of the water. **EUCON SRA-XT / Floor** should be used when shrinkage requirements mandate up to 50% reduction in shrinkage values.

CONEX is a dry powdered material that has early expansive characteristics. When **CONEX** comes into contact with water one of the components reacts immediately, similar to cement, and has an initial expansive quality. **CONEX** can function as a *shrinkage reducing material* when used at the lower rate of its suggested dosage range (*3-6 % by weight of cement*). *Shrinkage compensation* is achieved when using **CONEX** at the higher rate of the recommended dosage range (*6-10% by weight of cementitious*). When used correctly, this early expansion is enough to compensate for typical shrinkage which will be experienced within the concrete pore structure, resulting in greatly reduced overall shrinkage of the concrete. The reaction of **CONEX** is generally complete in the first 24 hours after exposure to water. For this reason, when performing length change testing in accordance with ASTM C-157, the specimens must be demolded and initial reading taken at 12 hours. If the initial shrinkage reading is delayed, the shrinkage results will appear as though the **CONEX** did not perform. **CONEX** should be used when shrinkage requirements demand shrinkage reduction of greater than 50% when compared to a reference concrete of the same design and materials.

The graph below shows the shrinkage typically experienced in reference Portland cement based concrete and concrete utilizing *Shrinkage Reducing admixtures* and *Shrinkage Compensating materials*.



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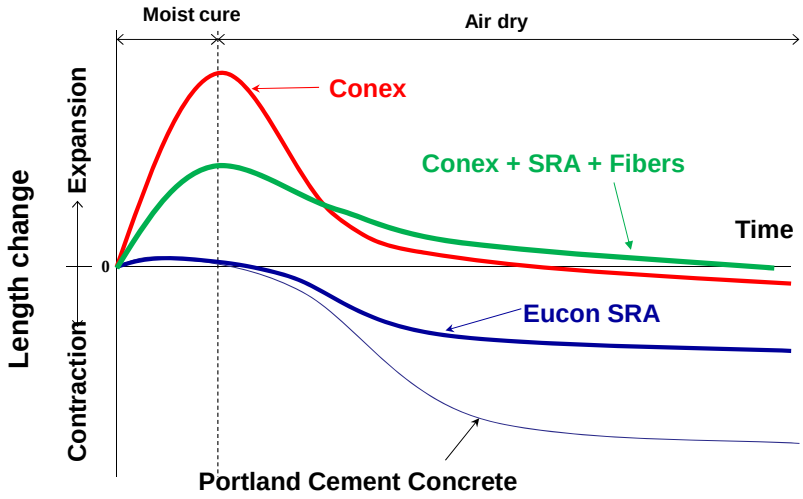
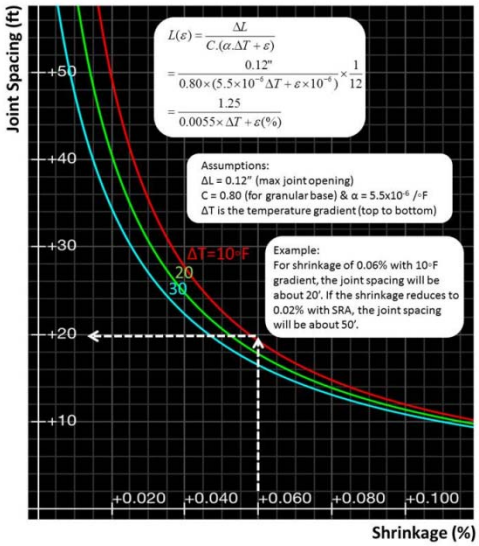
Fibers do not effectively reduce the amount of shrinkage of concrete. When used appropriately however, they increase the concrete's ability to withstand the stresses of concrete shrinkage which results in less and smaller cracks.



As the concrete industry moves closer toward the desire for crack free engineered floors, the use of these materials, as well as effectively optimized mix designs has become more and more prevalent. A combination of shrinkage compensating, shrinkage reducing and crack reduction can be achieved when using all three approaches offered by **Euclid Chemical**. The graph below shows length change results utilizing each of the mechanisms mentioned above. This combination approach can be considered in critical applications where minimal shrinkage (even slight expansion) is required and the formation of drying shrinkage cracks is to be kept to a minimum. This approach is also useful when typical ACI suggested joint spacing is to be increased or the number of ACI suggested joints is to be reduced.



This graph shows typical recommended joint spacing criteria (Darter and Barenberg, 1977) and has been used in FHWA reports and multiple publications.

This graph is based on an empirical equation and assumed criteria; the values may change based on assumed parameters and conditions.

*Use as comparative reference only

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