REDUCED CRACKING OF SLAB ON GROUND PROJECTS WITH SYNTHETIC FIBER REINFORCED CONCRETE

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Abstract

Cracking of slabs on ground can indicate major problems and compromised durability and detract from the appearance of monolithic construction. There are too many causes of cracking. Some causes of cracking are prioritized and discussed. Some cracking problems are more controllable by proper material selections and construction practices. Projects are discussed that show significant benefits by using synthetic fiber reinforced concrete to control cracking and increase durability.

Keywords: concrete cracking, slab on ground, synthetic fiber reinforced concrete

Introduction

Fiber reinforcement is a most effective way of improving the resistance of concrete to cracking, but little is known of the benefits of fiber reinforcement on long-term durability. The role of fiber reinforcement in enhancing durability can be understood from real-life situations and provide a foundation for life-cycle engineering analysis of fiber-reinforced concrete. Durable concrete could be described as concrete that lasts longer without cracks and concrete with cracks is not durable and has failed to last as long without cracks and may need to be replaced. [1]

Fiber reinforced concrete defined and basic understanding

In theory, FRC contains enough fibers to intercept and resist micro-cracks from becoming macro-cracks. Concrete is understood to be brittle and weak in tension. The purpose of conventional reinforcing is to hold broken macro pieces of concrete together and the purpose of fibers is to do the same reinforcing work with micro pieces of concrete – hold broken pieces of concrete together. Therefore, the significant difference between fibers and conventional reinforcing steel is a matter of scale and continuity.

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Fibers do not have the classical development length issues for full material strength without pull out. Therefore, reinforced is not a material but whatever holds broken concrete together and how well it holds it together is a matter of efficiency of the reinforcement and a different discussion than answering this question, are fibers really reinforcement? FRC works because of an understanding of two theories, strength of materials and fracture mechanics. [2]

**Some discussion of concrete cracking for slabs on ground**

Cracking in slabs on ground can be limited to primarily three types, tension due to shrinkage rate and differences, curling due to differences from initial casting of the concrete and shrinkage, and fatigue due to repeated loading from tension and curling.

**Second generation macro synthetic fiber, second project**

This second project was for an interior warehouse application and part of a two-year study regarding the benefits and affects of fibers and published as a series in a national magazine. The floor was 150 millimeters thickness and the saw cuts and fiber dosage varied. The building had 5,575 square meters total and saw cuts for 16.9 square meters with a fiber dosage of 0.20% and 150 square meters with a fiber dosage of 0.50%. The 0.50% dosage slabs had 80% less joints. There was no steel in any of the slabs and no mid-panel cracking. However, the significant difference in the fiber slabs was no curling in the 0.50% dosage slabs. [3]

**Conclusions**

Fibers can be used with confidence with a “calculated” risk to obtain what will work in a variety of concrete projects to increase durability and reduce cracking in concrete— for whatever reasons concrete cracks. Presently all of the observed behaviors may not be explainable but the scientific method dictates that fibers must be tried because of the repeatable observations of many successful applications.

**References**

[1] ACI Committee 224, 2001, “Control of Cracking in Concrete Structures (ACI 224R-01),” American Concrete Institute, Farmington Hills, MI, 46 pp.
