Effects of Basalt Fibers on Mechanical Properties of Concrete

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ABSTRACT

This paper presents the results of an experimental program carried out to investigate the effects of Basalt Fiber Reinforced Polymers (BFRP) on some fundamental mechanical properties of concrete. Basalt fibers formed by heating crushed basalt rocks and funnelling the molten basalt through a spinneret to form basalt filaments, but this type of fibers have not been widely used till recently.

Two commercially available chopped basalt fibers products with different aspect ratios were investigated, which are dry basalt (GeoTech Fiber) and basalt pre-soaked in an epoxy resin (GeoTech Matrix).

The experimental work included compression tests on 96 cylinders made of multiple batches of concrete with varying amounts of basalt fiber additives of the two mentioned types, along with control batches containing no basalt fibers. Furthermore, flexural tests of 24 prisms were carried out to measure the modulus of rupture, in addition to 30 concrete prisms for average residual strength test.

Results of the research indicated that use of basalt fibers has insignificant effects on compressive strength of plain concrete, where the increase in strength did not exceed about 5%. On the other hand, results suggest that the use of basalt may increase the compressive strength of concrete containing fly ash up to 40%. The rupture strength was increased also by 8% to 28% depending on mix and fiber types and contents. Finally, there was no clear correlation between the average residual strength and ratios of basalt fibers mixed with the different concrete batches.

Keywords: Basalt Fiber Reinforced Concrete, GeoTech Fiber, GeoTech Matrix, Compressive Strength, Flexural Strength, Average Residual Strength.