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Effects of high temperature and long term stress on the material behavior of high performance fibers for composites

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Abstract

Fiber composites are materials that are present in virtually all technical applications and can be found everywhere in our daily lives. Practically no other technology offers such potential nor has been so rapidly developed across all sectors. Fiber composites are made from fibers of extremely high strength and rigidity embedded in a matrix developed to meet the needs and requirements of the application, ranging from polymers to concrete and metal. The construction industry begins to discover high performance fibers as reinforcement elements for new construction, as well as retrofits and structural repair reinforcements. Not only must the reinforcements fulfill high strength requirements, but must also meet other technical safety prerequisites for structures. Among these requirements, structural safety under constant and long-term loads and resistance to high temperatures in the case of fire are the two of the most important. These aspects are essential for the certification and approval of textile reinforced concrete in commercial applications. To specify and classify the above-mentioned properties, experimental tests were conducted. The results of these tests are presented in this paper.

Key words: *Fiber composite, Carbon filament yarn, Glass filament yarn, High temperature behavior, Long-term behavior, Mechanical model, Textile reinforcements*

1. Introduction

Many technical applications implement fiber composite materials composed of high performance carbon and glass fibers. These fibers are extremely strong due to their physical and chemical properties. In the field of construction, intensive research has been conducted in the past 10 years on applications for high performance materials used as open-grid reinforcements for concrete elements.

A polymer coating based on styrol-butadine is used on the textile to improve the bond between the reinforcement structure and the concrete matrix. Numerous requirements regarding stability and load-bearing capabilities as well as serviceability under extreme conditions must be met not only by the textile structures themselves, but also by the applied coatings. Two such

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