



Textile Fibre Composites in Civil Engineering

Edited by T. C. Triantafillou

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Thanasis Triantafillou



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Part One

**Materials, production
technologies and
manufacturing of textile fibre
composites for structural and
civil engineering**

Manufacturing of textiles for civil engineering applications

1

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1.1 Introduction

Over the last 100 years, steel has traditionally been used as reinforcement for concrete. Along with a set of important positive properties of concrete structures, such as strength and stiffness, their weight is very high, and steel reinforcement limits the size and shape of concrete products. Moreover, reinforcing steel bars are subject to corrosion, which can cause destruction of the concrete by reducing the effective cross-sectional area of the bars and consequently increasing the stresses in the structure. One of the alternatives to conventional steel reinforcement is the use of textile reinforcement, which results in increased durability and reliability of civil engineering construction.

High-strength textile materials are widely used in various fields of construction, including the construction of unique buildings and structures, road construction, hydraulic engineering, and others. Textile reinforcement for composites includes various hierarchical structural levels: fiber, yarn, and fabric (Hearle et al., 1972). Traditionally, the reinforcement of composites with chopped, short fibers has been used for the manufacture of structural composites. The use of continuous reinforcement in the form of textile reinforcing structures has gained popularity in the last two or three decades. The main advantages of using them consist of sufficient flexibility of textile manufacturing processes and the possibility of using a wide range of raw materials. Reinforcement with textiles offers many opportunities, including manufacturing very thin composite and concrete parts, no risk of corrosion of reinforcement materials, and the ability to manufacture structural parts with complex shapes and predetermined properties.

In general, textiles are associated with clothing or household applications; however, today the application of textiles is broader in various branches of industry. In the manufacture of high-strength reinforcing materials, mainly fibers such as glass, carbon, aramid, basalt, and others are used. These types of fibers have very high mechanical characteristics (strength, modulus, etc.) comparable to those possessed by metals and sometimes exceeding them. As a consequence, it is necessary to ensure satisfactory processing of high-strength fibers for textile machines because of their high stiffness. The raw materials for the production of reinforcing structures have a critical deformation stiffness. Therefore, it is necessary to place special demands