

# DIFFERENT WOVEN CARBON FABRIC CONSTRUCTIONS EFFECT'S ON FLEXURAL STRENGTH OF CONCRETE BEAM

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**Abstract:** Textile products with functional features rather than aesthetic and decorative purposes are in the technical textile category. One of the areas is construction and buildings. The category of this area is classified as buildtech. High performance fibers are used in this area as a reinforcing element. Carbon fibers are one of the most important high performance fibers with their strength properties. In addition, there are many ways to produce textile surfaces from carbon fiber tows. Weaving is the most common production methods. Carbon tows are bundle of carbon fibers. Text is used as the threads counts of carbon tow more over additional naming method such as 3K, 6K, 12K, 24K. The effect of carbon-based woven fabrics on reinforcing flexural strength depending on their physical and chemical properties is the subject of research. Carbon fiber stands out in the field of reinforcement with its low density and high strength structure. When fabric is produced only one axis from carbon tow then it is called as unidirectional fabrics. If two axis (warp and weft) contains carbon tow, it is named as bidirectional fabrics. In this study, woven fabrics in the different fabric structure were produced with carbon yarns of 12K 800 tex and 24 K 1600 tex on specially designed weaving machines. Carbon woven fabrics structure on the flexural strength of concrete beams were investigated.

Another study conducted a hybrid reinforcement study of carbon, glass and glass-carbon blend, 4-point testing on 5 beams, one of which was a witness, with different layers. It provided flexural strengths between 30% and 98%. Compared to the unreinforced beam, 30% increase in strength was achieved in glass fabric and 57% in carbon fabric. [1]. High-performance fibres are defined as fibres with high tensile strength and high elastic modulus. Fibres in this group are referred to as HM-HT (high modulus-high tenacity) fibres. Fibres with a tensile strength greater than 3 GPa and an elastic modulus greater than 50 GPa are categorized as high-performance fibres [2]. 9 concrete beams with dimensions of 100x100x500 were produced. The concrete used had a compressive strength class of 30 MPa. CFRP (Carbon Fiber Reinforced Polymer) applications of varying dimensions using epoxy resin during the process. Different measurements were applied, and bending tests were conducted on the concrete beam specimens. In the control sample, they measured a flexural strength of 3.94 MPa, while the highest flexural strength value achieved in their study was 15.88. They achieved an increase in flexural strength ranging from 11% to 303% in their specimens [3].

**Keywords:** Carbon Fabric, Woven Carbon Fabric, CFRP, Beam Strength, Building Reinforcement, Flexural Strength, Technical Textile

**Table 1** Physical Properties of PAN-based Carbon Fibers

Properties	Commercial, Standart Modulus	Aviation-Space Industry		
		Standart Modulus	Intermediate Modulus	High Modulus
Tensile Modulus (GPa)	228	220-241	290-297	345-448
Tensile Strength (MPa)	3800	3450-4830	3450-6200	3450-5520
Break Elongation (%)	1,6	1,5-2,2	1,3-2,0	0,7-1,0
Density (g/cm <sup>3</sup> )	1,8	1,8	1,8	1,9



**Figure 1** a) Testing b) Breaking Point c) After test

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