

Analysis and Behaviour of CFRP-Strips at Deviation Saddle for CFRP Prestressed Bridges

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Summary

This research work presents the application of CFRP-Strips as prestressing elements for bridges, e.g. extradosed bridges and externally prestressed box girder concrete bridges. The application of CFRP-Strips as external pre-tensioned elements is not only governed by the general structural and dynamic behaviour of the hybrid system but also by having the right concept for the construction joints, i.e. the anchorage of the CFRP-Strips at the deviation saddle and at the deck structure. The load bearing capacity and the deformational behaviour of deviated CFRP-Strips is influenced mainly by contact surface, the deviation angle and the diameter of the deviation saddle. This paper introduces the results of an Experimental program of deviated CFRP-Strips at deviation saddle. The effect of the different parameters on the load bearing capacity, strain responses up to failure and the mode of failure of the CFRP-Strip at the deviation saddle will be investigated. Additionally, analytical study for the application of externally prestressed concrete bridges, i.e. Extradosed bridges is presented to highlight the efficiency of this application.

Keywords: Pre-stressed, CFRP-strips, Bridges, Saddle, Experimental, Design

1. Introduction and Scope

CFRP-Materials have been the focus of much attention in the engineering community since the development of light weight and high stiffness fibers in the 1940's. In the last two decades, the use of CFRP composites as a reinforcement for concrete members has emerged as one of the most exciting and promising technologies in materials / structural engineering. Due to the high price CFRP-Strips, its application today is mostly feasible in buildings, where its strength is highly utilized and the strips are needed in small quantities, e.g. in the strengthening and rehabilitation of reinforced concrete structural.

In the meantime the new developments/researches concentrate on gluing (bonding) the CFRP-Strips on the reinforced concrete construction with prestressing in order to improve the degree of utility of the high strength efficiently[1]. On contrary, the prestressed CFRP-Strips should be anchored in the concrete structural to transfer the prestressing force locally. This is not easy due to the sensitivity of the carbon fibers to transverse loads (Fig. 1). The development for CFRP-Strip anchorage is presently being under investigation in many research institutions and universities. The



Fig. 1: Köschtal bridge, Stuttgart-Germany