# TRANSFER AND DEVELOPMENT LENGTH OF CFRP RODS USED AS PRESTRESSING TENDONS

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Over the last decade, fiber reinforced polymers (FRP) have been studied as a possible replacement for conventional steel reinforcement in prestressed concrete structures. Particularly when carbon fiber polymer (CFRP) reinforcement is considered, there are significant potential benefits including noncorrosive and nonconductive material characteristics, a high tensile strength, and a low stiffness (elastic modulus) that results in reduced prestress losses.

In pretensioned applications, the tension (prestressing) force in the tendon is transmitted to the concrete via bond. Transfer length may be defined as the length over which the tendon must be bonded in order to fully develop the effective prestress. Development length may be defined as the distance over which the tendon must be bonded to develop the stress in the tendon at ultimate (flexural failure). Transfer and development length are dependent upon a number of factors, including the surface characteristics of the tendon and strength of the concrete.

This experimental study involves the determination of transfer and development length for a new CFRP rod (*Aslan 200*) manufactured by Hughes Brothers, Inc. of Seward, Nebraska. These parameters are established using tests on twelve single-tendon CFRP-prestressed concrete beams, four of which utilize normal strength concrete (5000 psi), four of which utilize a moderate high strength concrete (7000 psi) and four of which utilize a high strength concrete (9000 psi). Each beam is instrumented using DEMEC mechanical strain gauges during fabrication to measure transfer length. Beams are later tested to failure under a variety of load patterns (by varying the distance from the load point to the support reaction) and the type of failure noted as a flexural failure or a bond failure. These results are used to determine the development length of the tendon. The use of multiple concrete strengths will help to establish the effect of concrete release strength on transfer length, and the effect of concrete design strength on development length.