

REINFORCED CONCRETE FLEXURAL MEMBERS STRENGTHENED WITH NEAR SURFACE MOUNTED CFRP REINFORCEMENTS

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There is a fundamental need for a dependable mechanism of increasing the shear and flexural strengths of in-service flexural concrete members. This need is especially acute in highway and railroad bridges, and other transportation infrastructure. In these structures, it is frequently necessary to augment the existing strength of component beams, slabs, and walls due to material decay, damage, or increases in service loads. Externally bonded steel and FRP plates have been used but there are fundamental problems associated with each of these materials when employed as an external reinforcement. It has recently been proposed that many of these problems are reduced or eliminated when the reinforcement is embedded within the concrete, a technique referred to as near surface mounting (NSM). The use of high strength FRP reinforcement in a NSM application is a logical response to a growing need within our nation's transportation infrastructure. However, in order that the full potential of NSM/FRP technology is exploited, total system characterization must be understood.



This experimental study involves the testing to failure of simply supported steel reinforced concrete beams strengthened with near surface mounted (NSM) carbon fiber reinforced polymer (CFRP) materials. Strengthening is provided to increase flexural and shear capacity, and outcomes from the experimental data will focus on characterization of total system behavior including strength and stiffness, mode of failure, and force transfer properties between the CFRP and concrete. Existing analytical models for predicting structural behavior have been proposed but are based on a limited database and are recognized to be in need of verification and improvement.

Strengthening of concrete flexural members such as beams, slabs and walls with NSM CFRP reinforcement is an emerging technology with significant potential for reducing the rehabilitation costs associated with maintaining and upgrading our nation's transportation infrastructure.

Publications Resulting from this Work:

Yost, J. R., and Mildenberg, J., "Experimental Evaluation of CFRP Tape Material Properties," *Research Report submitted to Hughes Brothers, Inc., Seward, Nebraska, 2002.*