SHEAR CAPACITY OF FIBER REINFORCED POLYMER STRENGTHENED REINFORCED CONCRETE BEAMS

A DISSERTATION
SUBMITTED TO THE SCHOOL OF
CIVIL AND ENVIRONMENTAL ENGINEERING
UNIVERSITY OF ADELAIDE
FOR THE DEEGREE OF
DOCTOR OF PHILOSOPHY

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January 10, 2007

ABSTRACT

Plating using Fiber Reinforced Plastic (FRP) is one of the latest ways of retrofitting. Two of the most popular types of plating available are Externally Bonded (EB) and Near Surface Mounted (NSM) plating. EB plating (pultruded or wet lay up) is easy to apply but it debonds at low strain which limits the ductility, however, NSM plating, although slightly more difficult to apply debonds at higher strains. Both of these FRP plating systems are included in this research.

The major contribution of this thesis is towards the shear capacity and shear failure mechanism of reinforced concrete beams with adhesively bonded transverse NSM FRP plates. In shear strengthening, there are two forms of plate debonding that interact with each other consisting of Intermediate Crack (IC) debonding that is governed by the axial forces in the plates, and Critical Diagonal Crack plate debonding, where axial forces in the plate are induced by shear deformations. This research considers both forms of debonding and in particular their interaction.

Thirty eight pull tests with different types of plates, plate orientations and plate numbers were carried out on concrete prism and along with results from other researchers used in deriving a generic equation that can be used to predict the Intermediate Crack (IC) debonding resistance in plated beams. Furthermore, 8 beams tests were also carried out on simply supported beams strengthen with NSM plating to identify the plating contributions towards the shear capacity.

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