AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
STRUCTURAL ENGINEERING DEPARTMENT

RETROFITTING OF CONCRETE JOINTS USING SHOTCRETE TO ENHANCE ITS EARTHQUAKE RESISTANCE

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Thesis
Submitted in partial fulfillment for the requirements of the
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STATEMENT

This thesis is submitted to Ain Shams University, Cairo, Egypt, for the degree of Master of Science in Civil Engineering (Structural).

The work included in this thesis was carried out by the author in the Structural department, Faculty of engineering, Ain Shams University, from June 2009 to June 2012.

No part of this thesis has been submitted for a degree or qualification at any other University or Institute.

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Abstract of the M.Sc. Thesis Submitted by

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Title of the thesis:

RETROFITTING OF CONCRETE JOINTS USING SHOTCRETE TO ENHANCE ITS EARTHQUAKE RESISTANCE

ABSTRACT

Many reinforced concrete frame structures were designed and constructed before the development of modern seismic codes or according to the earlier versions of seismic codes. Thus these structures were designed only for gravity loads or for much lower lateral loads than the loads specified by the current seismic codes. Retrofitting of existing structures is one of the major challenges that civil engineers are facing these days. Beam-column joints, being the lateral and vertical load resisting members in RC structures are particularly vulnerable to failures during earthquakes and hence their retrofit is often the key to successful seismic retrofit strategy.

In this study, efficiency and effectiveness of using shotcrete technique in retrofitting and upgrading the shear strength and ductility of seismically deficient exterior beam-column joint has been studied. Nine exterior beam-column joint specimens were tested under reversed cyclic loading applied at beam end. These specimens were devided into 5 groups to study some variables. Group (1) comprises of two specimens to study the effect of applying shotcrete jacket. Group (2) comprises of two specimens to study the effect of using steel fibers in shotcrete mixture. Group (3) comprises of four specimens to study the effect of surface preparation and the use of shear dowels. Group (4) comprises of three specimens to study the effect of variable retrofitting length. Group (5) comprises of two specimens to study the effect of applying shotcrete for concrete column only.

Test results indicate that the application of shotcrete jacket effectively enhanced the seismic resistance beavior. On the other hand, surface preparation, the use of shear dowels, retrofitting a variable length of beam-column joint members, have not significant effect on the seismic behavior.

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