

## ABSTRACT

### ANALYTICAL MODELS AND GUIDELINES FOR THE DUCTILITY ENHANCEMENT OF CIRCULAR REINFORCED CONCRETE COLUMN BRIDGE BENTS USING FIBER REINFORCED POLYMERS

A retrofit methodology involving the displacement ductility capacity of circular reinforced concrete (RC) bridge bents wrapped with and without fiber reinforced polymers (FRP) is considered in this study. The methodology was developed using two discrete element based programs capable of generating a moment curvature analysis, force deflection plots, and the failure mode predictions of shear, longitudinal bar buckling, concrete confinement, and longitudinal bar rupture. The results of the programs were found to hold good agreements to other published findings, available commercial software, and the experimental testing of a 40% scale RC bridge bent. The programs and experimental testing culminated in the development of a two step retrofit process that utilizes a ductility wrap envelope (DWE) to determine the number of FRP wraps needed to reach a specified ductility, and a new proposed nonlinear pushover analysis that can more easily incorporate the use of a (DWE) for multi-column bridge bents versus current inelastic static analysis methods.

Christopher Michael Abela  
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