琉球大学学術リポジトリ

緊張PC鋼棒による能動横拘束を活用した袖壁タイプ耐震補強法（THW工法）の耐震性能と設計

メタデータ	言語: 出版者: 琉球大学 公開日: 2021-06-21 キーワード (Ja): キーワード (En): 作成者: Mohammad Zahid, NOORI メールアドレス: 所属:
URL	http://hdl.handle.net/20.500.12000/48605

Abstract of Doctoral Dissertation

Title: **Structural Design and Seismic Performance of Existing RC Buildings Retrofitted by Thick Hybrid Wing Wall**

This dissertation proposes new calculation models to evaluate seismic performance of existing soft first-story RC buildings retrofitted by applying Tick Hybrid Wing-wall (THW) technique. A new calculation method is developed for the flexural strength evaluation of retrofitted THW columns, and a minimum additional wall length ratio calculation equation is proposed for the affordability of THW technique. In addition, a new shear transition mechanism is proposed to evaluate the shear strength of retrofitted THW columns. Furthermore, a new seismic retrofit technique is developed based on the concept of THW technique to strengthen the existing multi-story RC buildings having bare frames (constructed on high seismic zones). THW is a strength–ductility type seismic retrofit technique for soft first–story RC buildings which is based on the monolithic behavior of a retrofitted THW columns. A retrofitted THW column is composed of the adjusted additional wall(s) to an existing RC column sandwiched by the steel plate and tightened by high strength PC bars. In a retrofitted THW column, the existing RC column, additional wall(s), steel plate and PC bars combinedly function as a shear and flexural resistant element against the induced forces by the earthquake. As consequence, the seismic performance (strength and ductility) of the retrofitted RC buildings improves. For the strength evaluation of retrofitted THW columns, a simplified flexural strength calculation equation and a shear transition (arch and truss) mechanism were proposed simultaneously to its innovation as a strength-ductility type seismic retrofit technique. The simplified equation was based on the wisely accepted American Concrete Institute (ACI) equivalent rectangular stress block parameters. For developing of simplified equation, tensile yielding of all longitudinal rebars in the existing RC column was assumed when the additional wall lies in the compression side. The shear transition mechanism was proposed under the assumption that the diagonal compressive strut depth ratio is 0.5, and the angle of truss mechanism is 45° according to the specifications of Architectural Institute of Japan (AIJ). Later, several investigations verified that both the simplified equation and the shear resistance mechanism have underestimated the actual strength improvement of the retrofitted THW columns due to the considered assumptions, particularly, when the acted axial force on the existing RC columns is high, and the additional wall length is short.

This thesis proposes a new flexural strength calculation method and a minimum additional wall length ratio calculation equation for the retrofitted THW columns regardless of rebar's yielding assumption. In addition, a new shear transition mechanism is developed for the retrofitted THW columns considering a variable diagonal strut depth due to the existed variation in the concrete strength and section's width (between the existing RC column and additional wall). The previous experimental data is arranged to verify the accuracy of proposed flexural strength evaluation method from the analytic and experimental perspectives. Furthermore, several specimens are tested to verify the proposed models. The lateral confinement effect caused by the steel plate and PC bars on the performance of THW columns is discussed. In addition, the proposed new seismic retrofit technique for RC buildings with bare frames is evaluated. The accuracy of proposed models was verified from the experiment and analytic perspectives. The effectiveness of adjusting minimum additional wall length was verified form the affordability and strength perspectives. The monolithic behavior of the retrofitted THW columns was observed.

NOORI Mohammad Zahid