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

Form 3

Abstract

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. In addition, a new shear transition mechanism for the retrofitted THW columns is introduced. Furthermore, a new seismic retrofit technique is developed based on the concept of THW to strengthen those existing RC buildings with bare frames that are constructed on high seismic zones. THW is a strength–ductility type seismic retrofit technique for soft first–story RC buildings that is based on the monolithic behavior of the 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. 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. For developing of the 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 because of the considered assumptions.

This thesis proposes a new flexural strength calculation method for the retrofitted THW columns regardless of rebar's yielding assumption. In addition, the developed shear transition mechanism in this thesis has 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, and several specimens are tested to verify the proposed calculation models. The lateral confinement effect caused by the steel plate and PC bars on the performance of THW columns is discussed. Furthermore, the proposed new seismic retrofit technique for existing RC buildings with bare frames is evaluated. The accuracy of proposed models and the effectiveness of adjusting minimum additional wall length ratio was verified form the strength and affordability perspectives. The monolithic behavior of the retrofitted THW columns was observed in this investigation.

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