論文 / 著書情報
Article / Book Information

題目(和文)	
Title(English)	Seismic Performance of Flexural Reinforced Concrete Walls with Confined Boundaries
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出典(和文)	学位:博士(工学), 学位授与機関:東京工業大学, 報告番号:甲第10837号, 授与年月日:2018年3月26日, 学位の種別:課程博士, 審査員:河野 進,坂田 弘安,山田 哲,吉敷 祥一,佐藤 大樹
Citation(English)	Degree:Doctor (Engineering), Conferring organization: Tokyo Institute of Technology, Report number:甲第10837号, Conferred date:2018/3/26, Degree Type:Course doctor, Examiner:,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	審査の要旨
Type(English)	Exam Summary

別　紙　1（論文博士）

論文審査の要旨及び審査員

（2000字程度）

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This thesis is entitled "Seismic Performance of Flexural Reinforced Concrete Walls with Confined Boundaries". It consists of seven chapters with an emphasis on the effects of confined boundaries detailing of RC walls on their seismic performance, and their ultimate deformation. RC structural walls with boundary columns are usually considered to have higher seismic resistance than rectangular walls since confined end regions provide confinement to wall panels and carry large amount of axial force. However, modern architectural demand has been requiring design engineers to produce slender walls with higher load and drift capacities. Observed damages to RC wall buildings in the 2010 Chile and 2011 New Zealand Earthquakes raised concerns about the seismic performance of rectangular RC walls, and suggest that additional research is needed to address issues related to observed failures as well as the actual seismic design provisions.

Chapter 1 "Introduction" briefly overviews state-of-the-art researches of seismic behavior of RC walls. The research scope and objectives is also explained including the necessity to evaluate the seismic behavior of RC structural walls.

Chapter 2 "Literature Review" presents literature review of seismic design and performance of reinforced concrete walls, and of observed damage to RC walls in Chile and New Zealand earthquakes. Issues related to finite element and fiber sectional analysis of RC walls are also presented with emphasis on plastic hinge length and stress-strain relations of concrete and reinforcement.

Chapter 3 "Experimental investigation of RC Structural Walls with Confinement End Regions" states the behavior of confined boundary regions in RC structural walls. The axial behavior of RC prism elements was experimentally studied by isolating the boundary regions of the wall. Sixteen RC prism elements, that idealized confined boundaries of RC walls, were tested to investigate the influence of longitudinal and transverse reinforcement detailing, cross-section slenderness and loading type (monotonic and cyclic) on their compressive capacity, damage process and failure modes. It was found that the tensile strain intensity prior to compression affected the performance of thin wall boundaries and lead to different failure modes when subjected to reverse cyclic loading. It was also found that dense transverse reinforcement detailing in thin confined boundaries did not improve their compressive capacities. A numerical model, taking into account buckling of reinforcement, was proposed to simulate response curves of cyclically loaded specimens. The model well simulated the reduced compressive capacity due to reinforcement buckling.

Chapter 4 "Analytical and numerical studies on confined boundary elements" presents evaluation of design and detailing rules to prevent global buckling and reinforcement bar buckling in confined boundaries. A longitudinal-to-transverse reinforcement index is proposed as anti-buckling measure of reinforcement. In order to simulate the hysteretic behavior of cyclically loaded elements, an accurate and reliable prediction of experimentally observed response is proposed. The model well describes important issues of the hysteretic behavior in both cyclic compression and tension with bar buckling behavior.

Chapter 5 "Experimental investigation of RC Structural Walls with Confined End Regions" states an experimental study on seven 40%-scale RC structural walls to investigate the effects of end region detailing on the flexural performance. The wall specimens included two walls with barbell shape section and five walls with rectangular cross-section. Primary test variables were cross sectional shape (rectangular and barbell shapes), transverse reinforcement ratio in confined end regions, shear span to wall length ratio, and axial load ratio. Rectangular walls had widely spread concrete crushing over the plastic hinge region with buckling of longitudinal reinforcement at final loading stage. Barbell-shaped walls had crushing of concrete limited within boundary columns, but this caused more brittle failure than rectangular walls. Barbell-shaped walls showed the efficiency of boundary columns in increasing deformation capacity and reducing damage level in the wall panel. It was also shown that the damage region was limited in height and tends to spread horizontally toward wall center. Test results made clear that end regions should be well confined when a structural wall, especially rectangular walls, is expected to sustain large deformation.

Chapter 6 "Numerical Study on Ultimate Deformation and plastic hinge length of RC Structural Walls with Confined Boundary Regions" shows numerical investigations on barbell shape and rectangular RC walls with confined boundaries to evaluate response curves and ultimate deformations. A nonlinear 2D and 3D finite element (FE) models were built in order to simulate the load-deformation relations under monotonic loading as well as cracking and damage patterns of tested walls. A sectional fiber model combined with plastic hinge length and shear deformation component is proposed in order to simulate the backbone curves and the ultimate deformation with less computational cost compared to the FE analysis. The sectional fiber model was able to provide relatively accurate backbone curves with good estimation of ultimate drift. An analytical equation is additionally proposed to estimate the ultimate displacement of RC structural walls with rectangular cross section. The proposed equation relates the ultimate deformation to key design parameters which are wall length, shear span, axial load ratio, and transverse reinforcement ratio at confined boundaries and was verified with existing experimental and simulation data.

Finally, Chapter 7 "Summary, Conclusions and Recommendations" summarizes the main results stated in each chapter and the conclusions obtained from this study. In addition, some suggestions for seismic design of RC walls are stated.

Mr. Taleb's work on reinforced concrete walls has a significant impact on the engineering community to secure safety of buildings and deserves a doctor of philosophy.