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種別(和文)	論文要旨
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（博士課程）
Doctoral Program

論 文 要 旨

THESIS SUMMARY

系・コース： Department of, Graduate major in	建築学 都市・環境学	系 コース	
学生氏名： Student's Name	DONG Yang		

申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of （ 工 学 ）
指導教員（主）： Academic Supervisor(main)	吉敷 祥一
指導教員（副）： Academic Supervisor(sub)	

要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

The dissertation is composed of four chapters entitled "Cyclic behaviors of square hollow section columns under small inelastic cycles". This study researched on the steel square hollow section (SHS) columns, which are widely used in the low- and middle-rise buildings in Japan, under a large number of small amplitude loadings. Limit states were figured out (i.e., local buckling and flange fracture) and corresponding evaluation methods were developed for the steel columns under long-duration earthquakes.

In Chapter 1 "Introduction", the research background related to the previous studies, and the necessity to understand the deformation capacity under a large number of small inelastic cycles in long-duration earthquakes were explained in detail. Even though the strong-column-weak-beam concept is employed in the current seismic design, significant plastic deformation is still required at the bottom end of the column in the first floor. The fracture properties and deformation performance at cyclic small amplitudes with a plasticity rate of 2.0 or less, and their corresponding evaluation methods have not been clarified. In view of the above, this study was conducted to better understand the deformation capacities and hysteresis behaviors of steel columns under cyclic small amplitude loading, and fill in knowledge gaps.

In Chapter 2, "Local buckling behaviors of SHS columns subjected to small inelastic cycles," cyclic loading tests were conducted on 26 full-scale square hollow section columns, focusing on local buckling behaviors. The main test parameters are width-thickness ratio, axial force ratio, shear span ratio, and loading history. Experiments have shown that even though clear local buckling does not occur in the first several cycles, the strength gradually decreases due to cyclic loadings, and the strength drops sharply at a certain point. The stability limit concept was proposed to represent the critical point when the column's strength starts to deteriorate rapidly. An accurate evaluation method for the number of cycles to reach the stability limit based on the equivalent width-thickness ratio of the cross section and various experimental parameters was proposed. The evaluation method can be applicable even under random loading histories. In addition, it was further applied to time history response analysis as a damage evaluation index. Compared with a previous damage evaluation method based on maximum strength in the conventional skeleton curve, the current proposed concept was more conservative and better to represent the onset of the deterioration.

In Chapter 3, "Low cycle fatigue behaviors of SHS columns subjected to small inelastic cycles," cyclic loading tests on 22 full-scale square hollow section columns, focusing on low-cycle fatigue behaviors. Compared with specimens in Chapter 2, smaller width-thickness ratio, axial force ratio, and loading amplitude were employed. In all specimens, cracks initiated from the corners, propagated in the width direction, and finally fractured through. Based on these experimental results, we proposed a method for evaluating the number of cycles until low-cycle fatigue, considering various experimental parameters. The transition boundaries between two failure modes (i.e., local buckling and flange fracture) were determined with the concept of the stability limit and low cycle fatigue life, respectively.

In Chapter 4, "Conclusions and future work" summarizes the knowledge obtained in each chapter and conclusions in this research. The design recommendations were also provided for the steel structures under long-duration earthquakes based on the findings in this research.

In summary, this paper clarifies two types of failure modes for SHS columns under long-duration earthquakes. The research constructed proper seismic performance evaluation methods, and offered recommendations for practice, which was of significant importance to the field of structural engineering.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).