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著者(和文)	劉錫媛
Author(English)	LIU Xiyuan
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種別(和文)	論文要旨
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（博士課程）
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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	申請学位（専攻分野）： Academic Degree Requested	博士 Doctor of	（ 学術 ）
学生氏名： Student's Name	LIU Xiyuan		審査員主査： Chief Examiner	佐藤 大樹 准教授	

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

The title of this doctoral dissertation is "Performance-degradation prediction of nonlinear viscous dampers installed in high-rise buildings under long-period ground motions".

It consists of six chapters, and mainly divided into three parts. Part1 (Chapter 2) investigated the experimental characteristic of viscous dampers considering the temperature difference between the damper and its surroundings. Part 2 (Chapter 3 and Chapter 4) verified the seismic response considering performance degradation of viscous dampers. Part 3 (Chapter 5) proposed a prediction method for the performance degradation of nonlinear viscous dampers installed in the high-rise buildings subjected to long-period ground motions.

The viscous dampers are one of the most widely used energy dissipation devices to protect the buildings. When viscous dampers are subjected to long-period ground motions, the input energy could be continuously imposed on the damper, which in turn causes the performance degradation of viscous dampers. However, no method has been proposed for the performance prediction of viscous dampers installed in the high-rise buildings subjected to long-period ground motions. To deal with this problem, this dissertation used the energy dissipation to predict the performance degradation.

Chapter 1 establishes the foundational concepts of long-period ground motion and passive control devices, presents a brief history of the viscous dampers application in mitigating structural vibrations, and the fundamentals of linear and nonlinear viscoelastic behavior. It also presents current modeling methods and studies on the viscous dampers.

Chapter 2 performed the experiments using full-scaled viscous damper to verify the effectiveness of the equivalent sinusoidal wave method and investigate the accuracy of this method by different ambient temperature, and different damper-ambience temperature difference (the temperature difference between damper and its surroundings). It indicates that the damper-ambience temperature difference will affect the temperature rise of viscous dampers. On the other hand, the equivalent sinusoidal wave method can reproduce the accuracy with high accuracy from random wave loadings.

Chapter 3 demonstrates that the performance degradation of viscous dampers can be effectively evaluated using energy density without the influence of temperature variations. The analytical model successfully predicts force reduction and energy dissipation trends, making it a reliable tool for evaluating damper performance under long-period ground motions.

Chapter 4 evaluates the seismic response by using the analysis model considering the performance degradation of viscous dampers. Results indicate larger size damper, smaller target story drift ratio, and higher height of the building result in less performance degradation, leading to less increase in seismic response.

Chapter 5 proposed a prediction method of the total energy dissipation of viscous dampers based on energy balance. The prediction accuracy is verified by comparing with the results of time history analysis.

Chapter 6 gives the conclusions and recommendations for future works.

This dissertation contributes to structural engineering by:

- The effectiveness of the equivalents sinusoidal wave method on the viscous dampers was verified.
- The performance degradation of viscous dampers can be effectively evaluated using energy density without the influence of temperature variations.
- The seismic response by using the analysis model considering the performance degradation of viscous dampers was investigated.
- A prediction method of the energy distribution coefficient for the nonlinear viscous dampers was verified.