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Aiqun Li

Vibration Control for Building Structures

Theory and Applications



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ISSN 2366-259X ISSN 2366-2603 (electronic) Springer Tracts in Civil Engineering ISBN 978-3-030-40789-6 ISBN 978-3-030-40790-2 (eBook) https://doi.org/10.1007/978-3-030-40790-2

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Preface

The author graduated from the Department of Civil Engineering, Southeast University of China, in December 1992, majored in structural engineering, and obtained the doctor's degree. Then, the author taught in Southeast University from 1993 to 2015, and now works in Beijing University of Civil Engineering and Architecture from 2015.

Since 1990, the author has paid attention to and entered the research field of structural vibration control, which has lasted for 30 years. In retrospect, the initial research only focused on the subject. With the deepening of the research, the questions that often linger in the author's mind include: how to scientifically recognize and describe the strong earthquakes and hurricanes; how to face the randomness and destructiveness of strong earthquakes and hurricanes; how to ensure the performance-based designs of building structure system and its resistances to earthquake and wind; and how to study appropriate high-performance vibration reduction and isolation technologies to ensure the building structure has higher and better disaster prevention ability.

According to the fortification goal of "no damage under small earthquakes and no collapse under large earthquakes," the houses under a strong earthquake are already "standing ruins." How to ensure that the houses on which people live are safe under the large earthquake and strong wind should be the common expectation of people in modern society.

The disaster investigation and experience of previous large earthquakes and gales show that earthquakes and gales are random and destructive. By improving the anti-seismic and anti-wind abilities of buildings, or expressed as, as long as buildings have the ability to resist large earthquakes and gales, buildings will certainly become a real "safe and secure beautiful home."

With the rapid development of the urbanization process of human society, the building structure has been developing toward the direction of higher height, larger span, and more complex structure. However, once a strong earthquake or hurricane occurs, whether these important buildings have the proper anti-vibration ability will test our managers, designers, and construction engineers. For the buildings located in high-intensity areas, buildings pursuing high-performance structures, hospital buildings, school buildings, lifeline buildings, no matter whether they are new or existing, the structural vibration reduction and isolation technology is presumably an important technical choice to make them have better seismic capacity.

This book is the part of the author's periodical academic achievements (1990–2019) in the research of structural vibration reduction control, including four parts: the basic principle of structural vibration reduction control, structural vibration reduction device, structural vibration reduction design method and structural vibration reduction reduction engineering practice.

The theory, method, technology, and application in this book can also be used as reference for other engineering structure vibration reduction research and practice.

The research work of the author has been greatly supported by the National Natural Science Foundation of China (59238160, 50038010, 59408012, 59978009, and 51438002), the Key Projects in the National Science and Technology Pillar Program (2006BAJ03A04), and the National Key Research and Development Program of China (2017YFC0703602).

Thanks to Dr. Chen Xin, Dr. Zhou Guangpan, and Dr. Deng Yang in the author's team for their important contributions to the publication of this book.

Thanks to Dr. Jia Junbo, alumnus of Southeast University and academician of Norwegian Academy of Engineering, for his important contribution to the publication of this book.

I would like to dedicate this book to my two respected teachers who have passed away: Prof. Ding Dajun of Southeast University, a famous expert of civil engineering, and Prof. Cheng Wenrang of Southeast University, a famous expert of high-rise building structure.

In the process of research and writing, the author has learned and referred to a large number of works at home and abroad. I would like to extend my sincere thanks and respect to the original author!

Beijing, China December 2019 Aiqun Li

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