Improving Earthquake and Cyclone Resistance of Structures

Guidelines for the Indian Subcontinent

Sekhar Chandra Dutta
Parthasarathi Mukhopadhyay

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ISBN 978-81-7993-302-2

Suggested citation

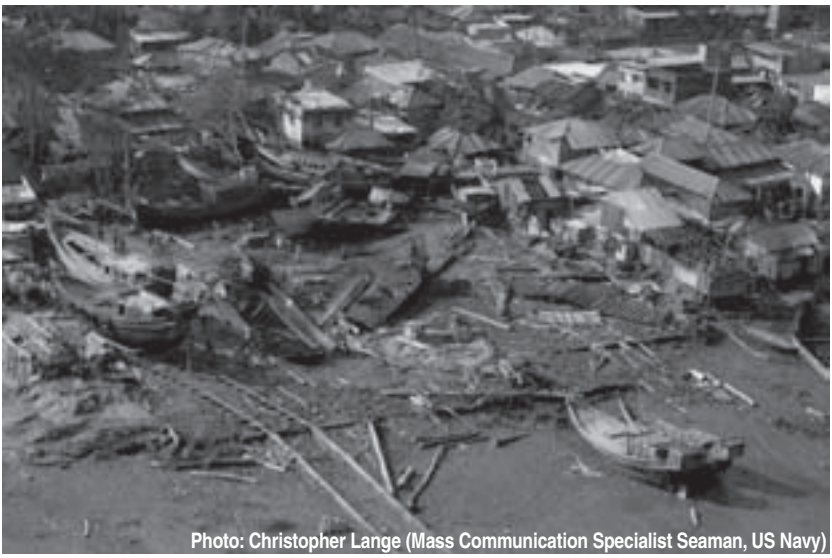
Dutta S. C., and P., Mukhopadhyay. 2012. *Improving Earthquake and Cyclone Resistance of Structures: guidelines for the Indian subcontinent*. New Delhi: TERI

Published by
The Energy and Resources Institute (TERI)
TERI Press
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi – 110 003
India

Tel. 2468 2100 or 4150 4900
Fax 2468 2144 or 2468 2145
India +91 • Delhi (0)11
E-mail teripress@teri.res.in
Website www.teriin.org

Printed in India

Dedicated to the millions who lost their dear ones and their properties to the devastating Sidr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Foreword

Natural calamities in the form of earthquakes and cyclones have become global phenomena. From all over the world, we hear of the havoc wreaked by these hazards every now and then. The question that arises is: Are we in a position to safeguard our building structures against such calamities in an appropriate manner in our country? The answer to this question may be in the affirmative, but it needs the wholehearted support of all stakeholders involved—the owners, planners, designers, and builders associated with the system. Unless all the stakeholders are serious about what they intend to achieve, it will not be possible to safeguard buildings against such calamities. Efforts have been made in the past by different bodies to generate awareness amongst architects, designers, and builders. In my opinion, we could achieve more success by generating awareness among masses about the developments that have taken place since then. Indian standards have been modified to take into account the changing scenario. However, much more is needed to establish the developed criteria as practice to make buildings resistant against these calamities.

Improving Earthquake and Cyclone Resistance of Structures: guidelines for the Indian subcontinent, authored by Prof. Sekhar Chandra Dutta and Prof. Parthasarathi Mukhopadhyay, is a step towards this end. I am extremely happy that the authors have taken the initiative to present the guidelines for these two calamities, which are extremely important in the Indian context. This book will provide readers with ample opportunity to understand in detail the underlying principles for safeguarding building structures against earthquakes and cyclones.

The authors have made an attempt to make this book as comprehensive as possible. I am sure that it will be a useful reading material for all concerned and wish the authors every success in this endeavour.

S K Bhattacharyya
Director
Central Building Research Institute
Council of Scientific and Industrial Research

Preface

Since the dawn of human civilization, mankind has engaged in taming nature for his own survival and benefit. His efforts intensified with the advent of the Industrial Revolution, which was initiated by Watt's endeavour in utilizing steam to run engines. Mankind's triumph over nature gathered further momentum, particularly in the past half-century, when human civilization witnessed incredible events ranging from ventures into space to development of sophisticated humanoid robots. However, amidst all these developments, scientific advancements have faced the vagaries of nature. Furthermore, of the different types of catastrophes, earthquakes and cyclones together are responsible for the overwhelming majority of global damages caused by natural disasters in the last decade, leaving millions of people homeless.

Common people are not fully aware of the vulnerability of human settlements to such disasters and the related risks. Even when people are in a position to appreciate the perceptible difference between safe and unsafe buildings in the context of disaster-related hazards, the options of planning, design, and construction to reduce the vulnerability of infrastructure to natural hazards have often been ignored due to the perceived higher costs and lack of appropriate expertise. Contrary to common perception, implementation of hazard-proof measures in a building can be relatively inexpensive in terms of construction costs, and it may provide long-term benefit to development projects. Evolution of such measures in the form of guidelines is rooted in the understanding of the principles of mechanics of regulating the behaviour of structures under the lateral dynamic loading imparted by earthquakes and cyclones. Most of these guidelines are already followed by eminent technologists,

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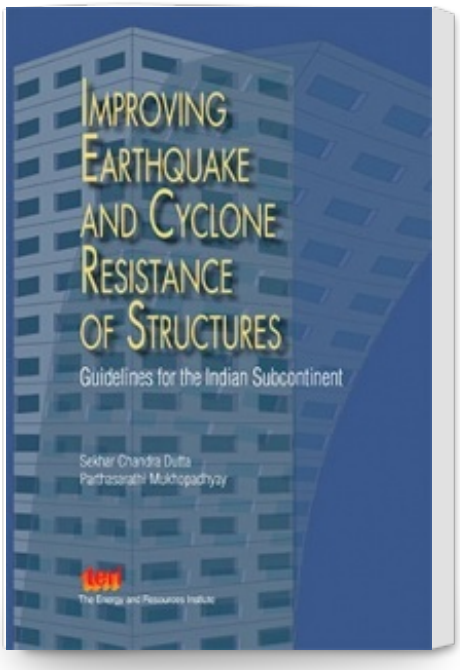

Publisher : TERI Press

ISBN : 9788179933022

Author : Sekhar Chandra Dutta, Parthasarathi Mukhopadhyay