

Preface

The idea of adding a certain amount of extra external force in earthquake-resistant design to improve seismic performance has now become outdated. The early design philosophy centered on the strength and ductility required to safely resist a certain level of earthquake shaking. However, the 1995 Southern Hyogo Prefecture Earthquake (Kobe Earthquake) proved to be a catalyst that led to a societal demand for buildings that remain functional even after severe earthquakes. As a result, seismically isolated structures have since been widely adopted and seismic isolation accepted as a seismic design solution.

Many types of architectural structures benefit from a functional seismic performance objective, particularly those that play a disaster response role, such as emergency response facilities, advanced medical centers, telecommunication infrastructure, datacenters and regional government facilities. Others include buildings with valuable contents or where the value added by minimizing damage is desired.

Similarly, modern architectural needs are often difficult to accommodate in high seismic regions, including the free forms resulting from design-oriented planning, eccentric plans and complicated structural systems required for some building functions, and preservation of historical, but vulnerable architecture for future generations. Seismic isolation offers an efficient and performative structural system to meet these needs.

Nevertheless, recent earthquakes have highlighted new challenges in seismic design. The 2011 off the Pacific coast of Tohoku Earthquake was particularly consequential due to the significant long-period and long-duration ground motion, even if most damage was caused by the tsunami. The large affected area also reemphasized the need to not only design the structure for the earthquake demands, but also to protect the non-structural components. The experience of the 2016 Kumamoto Earthquake sequence also had a major influence, with multiple large earthquakes occurring in close succession in the same area.

These needs and new findings have led to a progression in design practice since the Building Standard Law was revised in 1981. Damage to the non-structural components, furniture and building contents was previously only a minor focus, but has since been recognized as a central design consideration.

In May 2018, the Ministry of Land, Infrastructure, Transport and Tourism published the "Functional Continuity Guidelines for Disaster Prevention Buildings." Post-earthquake functional continuity is desired not only for government but also private facilities, which often meet important society needs following a disaster.

Structural engineers have advocated for a new design paradigm of "performance-based design", which enable seismic performance expectations to be explicitly and intentionally decided with the building owners, including the level of damage permitted in large earthquakes. It is now common practice to specify enhanced seismic performance objectives and to adopt seismic isolation as part of the design solution.

This book has been compiled with the aim of providing a practical reference for architects and building designers, and to promote the further technological improvement and development of seismically isolated systems.

In light of this context, the editorial committee selected the following themes for this book:

- How does seismic isolation solve the seismic design demands and challenges of complex architecture?
- What are the key design points to consider for seismically isolated buildings?
- Dissect seismically isolated buildings to spread familiarity with practical details
- Share the different seismically isolation technologies

This book will help expand the use of seismic isolation to protect against future large earthquakes and add value to commercial, cultural, medical, welfare, production, logistics and academic buildings in earthquake-prone countries.

We hope that it will illuminate the process of implementing seismic isolation and protect valuable social capital. Thus, this book is titled " Seismic Isolation Planned, Designed and Detailed: An Architectural Solution for Earthquake-Prone Countries".

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All editorial committee members