BOOK REVIEWS

Title: Earthquake and Volcanic Eruptions: a Handbook of Risk Assessment

Author: Herbert Tiedemann

Publisher: The Swiss Reinsurance Co., Zürich, 1992, 951pp.

Price: US$180.00

ISBN: --

This is a major work with significant appeal not only to structural engineers of New Zealand, but also to architects, developers and members of the insurance industry. Because of the dominance of seismic issues it may be considered as an encyclopedia of earthquake engineering where the latter is taken in a broad sense. As expected, it addresses primarily the sources, the nature, the consequences, the mitigation of and compensation for damage rather than issues relevant to survival. Thus the volume will have particular appeal to insurers. The text is supplemented with over 700 superbly prepared graphs and coloured pictures. The latter represents perhaps the most extensive collection of the display of damage.

This monumental work deals with the subject in three parts.

Part 1 gives the background to earthquakes and volcanism. It will appeal to seismologists and will satisfy the curiosity of architects and structural engineers and others within the construction industry. To name only a few, the following topics are covered comprehensively : Plate tectonics faulting, foci, earthquake magnitude and intensity, origin of isoseismal maps, probability considerations and risk maps, the fundamentals of ground motions, geology and subsoil conditions, tsunamis and earthquake prediction.

Some 170 pages are devoted to aspects of volcanism such as magma, products of and types of eruptions, the relevance of distances, areas, volumes and probability, types of damage, warning and prediction, protection and risk optimisation.

In Part 2 some 370 pages are assigned to damage caused by earthquakes. This part surveys design considerations relevant to ground motions, response spectra, behaviour of buildings, common procedures and effects of structural irregularity. It lists and illustrates common defects in design, the advantages and disadvantages of different structural systems, design and construction requirements embodied in building codes. Aspects of damage are examined in considerable detail including the role of subsoil, site effects, material properties, workmanship, foundations, orientational sensitivity, non-structural damage and damage statistics.

Special sections are devoted to industrial and civil engineering structures, such as towers, silos, treatment plants, railways, wharfs and docks, subways, bridges, pipelines and dams. Attention is also given to mechanical, electrical, chemical plants and related equipment.

Other aspects within this large part on earthquake damage include fire and explosions following earthquakes, contents of buildings, factories and stores, interruption of business, exposures in various insurance branches (marine, vehicles, glass, third party liability, life, accidents and health), repair and protective devices.

Emphasis in damage evaluation is perhaps disproportionately placed in this book on statistical studies covering mainly the effects of earthquakes in this century. This includes construction, the vast majority of which would be considered as unsatisfactory in terms of modern seismic design philosophies and practices. Often assessment of likely building response is based on widely used but by now outdated design concepts and particularly on traditional rather than rational and experimentally verified construction (detailing) requirements. As a basis for seismic design the author advocates the emphasis on increased strength of structures and advances a rather gloomy view on the role of ductility. In view of the insurance industry's major concern for damage mitigation, this opinion is perhaps understandable. The currently used two levels of seismic design, one in accordance with a serviceability limit state that addresses primarily the protection of building contents, and the ultimate limit state that concerns mainly the structure, are not reported. New Zealand structural engineers will find that local code provisions for both design and construction cater well for most of the design aspects considered in this book to be unsatisfactory or of doubtful quality.

Part 3 of the book covers insurance aspects, risk optimisation, disaster management and research and rescue. It describes rating and correlated issues with the aid of numerous graphs, indemnity limits, layered and non-proportional covers and provides extensive and detailed rating examples. It concludes with the coverage of portfolio aspects, assessment and control, and risk optimisation.

A 94 page separate supplementary catalogue of earthquakes and volcanic eruptions describes a large number of historical instrumented earthquakes and is accompanied by three seismic index maps.

Numerous appendices and a very extensive glossary, index and bibliography, over close to 200 pages, facilitate the efficient use of this handbook. It is considered to be a valuable asset in the offices of structural and mechanical engineers, architects and all those involved with earthquake insurance. Designers who are required to evaluate seismic risk for a particular project rather than rely on assessments implied by codes, will find the information very useful.

T. Paulay

NOTE: *The book may be ordered from the Swiss Reinsurance Company, Mythenquai 50/60, Zürich, Switzerland.*

Title: **"An Introduction to Seismic Isolation"**

Authors: RI Skinner, WH Robinson and GH McVerry

Publisher: John Wiley and Sons, Chichester, UK, 1993

ISBN: 0 471 93433 X

The interest of the authors in the field of seismic isolation began over 25 years ago, in 1967, when a group of earthquake engineering researchers at the (then) DSIR Physics and Engineering Laboratory (PEL) became involved in design studies for a "stepping" bridge over the Rangitikei River. The system adopted included steel-beam dampers and laminated-rubber components. The use of similar components was then considered as a means of providing seismic isolation for the William Clayton building in Wellington. However, interaction with the materials science researchers at PEL occurred at an early stage. This group was interested in the behaviour of plastically deforming metals and they went on to develop a range of isolator components based on lead to provide lead extrusion dampers and lead-rubber isolators. It was the latter that came to be used in the William Clayton building. Since this time, the researchers at the Physics and Engineering Laboratory have developed and tested many of the current seismic isolation devices used throughout the world and have helped develop some of the various design methods. It is fitting that they are the authors of the first text on the application of seismic isolation methods to engineering structures.

This book of 354 pages is indeed a very thorough "introduction" to the subject as it covers all the major aspects of seismic isolation, the properties of the structures, isolation devices and systems, the response of isolated structures, the design of isolation systems, and gives examples of isolation applied to both buildings and bridges. Many of the examples illustrated are structures that have been built in New Zealand and in which the authors have been consulted in the design process and the devices developed by PEL have been used. The design methods discussed in the book cover many of the different approaches used around the world for the design of seismically isolated structures. The book contains a large number of references on all aspects of seismic isolation and this will be of immense value to researchers in this field.

The book appears to be aimed at both practising design engineers looking for insight into the application of seismic isolation to engineering structures and also at researchers attempting to further the development of design methods for seismically isolated structures. To this end, the authors have oriented the mathematical analysis of the seismic responses to give a clear understanding of the processes involved and have provided initial isolator parameter values for engineers or architects wishing to incorporate seismic isolation in their designs.

Throughout the book there is a logical progression in its coverage of seismic isolation with the chapter topics covering:

1. **Introduction.**
   Concepts of seismic isolation, comparison with conventional design, components and application.

2. **General Features of Structures with Seismic Isolation.**
   Response spectra, modes of free vibration, effects of isolation, selection of isolation systems, etc.

3. **Isolator Devices and Systems.**
   Yielding steel devices, lead extrusion dampers, elastomeric and lead-rubber bearings, PTFE bearings, buffers.

4. **Structures with Seismic Isolation: Responses and Response Mechanisms.**
   Linear structures with linear and bilinear isolation, secondary systems, torsionally unbalanced structures.

5. **A Basis for the Design of Seismically Isolated Structures.**
   General approach, design procedures, design examples.

6. **Applications of Seismic Isolation.**
   Structures isolated in New Zealand, the USA and Italy. Isolation of delicate or potentially hazardous structures.

The book is well written and contains a large number of photographs, diagrams and graphs. It makes a clear presentation of the various concepts and takes the reader through the calculation steps in the design examples. In discussing the applications of isolation techniques to structures, the figures clearly show how the designers have applied the technique to provide the required level of protection for their structures.

This book should become essential reading not only for those practising engineers who are unfamiliar with the concepts of seismic isolation and wish to gain an understanding, but also to those who are but want a concise guide to what is sound engineering practice. It also sets a very high standard for future texts on the subject.