

BOOK REVIEWS

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

Author: Herbert Tiedemann

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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.*