

BOOK REVIEW

Review of **"Seismic Design of Reinforced Concrete and Masonry Buildings"**
by **T.Paulay and M.J.N.Priestley**

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Earthquakes do not recognize geographical or political boundaries and neither does this book. Though it draws largely on US, Japanese and New Zealand experience, it succeeds in presenting the subject in a way which will have universal appeal. The authors have consciously avoided direct reference to particular code requirements and focus on the principles, concepts and details which form the basis of most code provisions.

Over the past 30 years New Zealand researchers have made notable and disproportionate contributions to the field of earthquake engineering. This has been in large part due to the influence of Professor Tom Paulay whose enthusiasm for seismic design and attention to detailing has developed a strong sense of the fundamentals in his many students. Research at the University of Canterbury on this subject has been extensive, relevant and well executed. A notable contributor, particularly in the field of masonry, was Dr Nigel Priestley who has now moved to San Diego where he continues his research and helps to spread the influence of New Zealanders amongst earthquake engineers in the US. The Canterbury research was headed by Professor Bob Park, whose thorough and professional approach has helped him and his colleagues produce papers of consistently high quality.

The papers on seismic design by Park, Paulay and Priestley have been notable not just for their technical content, but for the quality of presentation. Material has been carefully organised and illustrated. Diagrams have received particular attention to confine them to essential details, while bringing out the relevant points.

And so it is with this book. The content represents the best of the research work at Canterbury over the last two decades, served up with appropriate commentary and explanation. Targeted at "structural engineers in seismic regions and to students", it should also find a place on the desks of earthquake engineering researchers around the world.

The introductory chapters offer a brief and relevant overview of the essentials of seismic resistance, seismicity, dynamic response of structures and the philosophy of capacity design. This philosophy, which is now gaining world wide recognition, is well illustrated with an analogy to a chain made with an intentional weak but ductile link. Design procedures have been developed extensively for practical applications by the authors. The capacity design philosophy is fundamental to modern seismic design and forms the underlying theme of this book.

And this is a book on design - in spite of the cover implying a bias towards analysis. For those engineers who long for a text which addresses what to do with that computer output, the authors' attention to relative strengths, detailing, practical concepts and even examples, offers much to satisfy. Not only on what to do, but, more importantly, on why - and in some cases why not.

And we should be clear also what the authors mean by masonry. The text and diagrams leave us in no doubt that masonry means structural masonry, made to exacting specifications, so that the approaches taken can be similar to those taken for reinforced concrete. Ductile masonry frames and walls are covered, so this is clearly not the masonry of many (most ?) of the world's buildings. Engineers in countries where high quality structural masonry is not achieved should curb any desire to construct in this material until they are sure the required standards can be met.

But the material in the book may well provide an incentive to promote higher quality masonry. The chapters in the book give extensive detail on analysis of forces within the structural elements and the necessary detailing to achieve strength and ductility. This includes such things as confinement steel in the mortar joints, which has been demonstrated to improve performance measurably.

There are no code formulae in the book, although many of the equations have a familiar look. The authors have deliberately left out specific references to code requirements, pointing out that these are becoming increasingly similar, and certainly based on the same basic concepts and approaches. This is evident in the interesting section which compares Japanese, US and New Zealand force levels for various structures and foundation conditions. Even in the design example of an 8- storey frame, no specific code is quoted, but both metric and imperial units are given.

Columns and beam- column joints are fully explained and many engineers will welcome a condensed update on the state of the art and the reasons behind the code formulae.

Walls are a particular specialty of the first author, and coverage is comprehensive from layouts, to the finer points of detailing, and from squat walls to ductile coupled walls in high rise buildings. As always, illustrations are superb and reflect the author's unmatched insight into the subject. Equally consistently, capacity design is the underlying theme - in an attempt to predetermine the response of the building no matter what the characteristics of the earthquake - "telling the structure what to do".

Of interest to researchers and designers will be the chapter on dual systems, where a combination of frames and walls are used for seismic resistance. Designers should take note because of the many cautionary remarks made about possibly unconservative effects of the interaction. For example, the common practice of allocating a proportion of the lateral forces to walls and the remainder to frames is stated as being entirely inappropriate. It is shown that even when the apportioning is done on the basis of relative elastic stiffness, effects can be serious. Foundation flexibility is shown to play an important part and so too does the inelastic response of the structure. Both factors can greatly increase the shears in the lower columns of the frame.

The concept of rocking walls is briefly mentioned, and a capacity design procedure is outlined for dual systems. These topics should interest researchers - there are still many unknowns to be resolved before such procedures can be codified.