

BOOK REVIEW

Title: "Concrete Structures in Earthquake Zones: Design and Analysis"
Editor: Edmund Booth
Publishers: Longman Group UK Ltd and John Wiley and Sons, New York, 1994, 368pp
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This very readable book primarily addresses designers of reinforced concrete structures, but potential readers interested in the fundamental issues of earthquake structural engineering will also find it most informative. It copes well with the formidable challenge of providing within only some 370 pages, in-depth information related to a wide range of topics. It directs readers consistently to specialist resources where topics cannot be treated in sufficient detail within the extent of the book. The editor and principal author, Edmund Booth of Ove Arup and Partners, London, has succeeded well in integrating the contributions of eight co-authors. While there is some overlap of discussion of the principal issues by the different contributors, this is perhaps inevitable where a number of contributors are involved. There is a significant input from New Zealand.

After an overview of design principles relevant to the effects of earthquakes, the choice of structural systems for buildings is reviewed. The presentation is strengthened by experience accumulated from design practice. A condensation of the types of available analysis techniques is well illustrated and balanced with respect to the content of the book. It provides a very satisfactory perspective of the role of analysis within the total design effort, a quality seldom found in the relevant literature emerging from universities.

The contribution of the second principal author, Richard Fenwick, Associate Professor of Civil Engineering at the University of Auckland, is of major significance. It addresses diverse issues of the behaviour of reinforced and prestressed concrete in a seismic environment. Instead of the common assumptions used for analytical modelling, it emphasises the important differences between material and component responses to monotonic and reversing cyclic loading. Particularly interesting and useful features, based on original research and virtually absent in the relevant literature, are the effects of plastic hinge formation with reversing rotations on the change of member length and shear strength. This chapter is essential for the implementation of the design of moment-resisting frames, shear walls and diaphragms, presented in the subsequent three chapters.

One chapter is devoted to a comparison of code provisions in the United States, New Zealand, Japan and Europe (Eurocode 8). While this is very informative, structural practitioners

would probably appreciate more extensive critical and constructive comments and an expression of the author's views with respect to issues on which these codes differ.

The examination in two chapters of the seismic response of soils and foundations and that of structures with passive and active control is presented in a very readable manner. It enhances the understanding of relevant issues by readers without special knowledge of earthquake engineering.

The book concludes with a review of the most important aspects that need to be considered in the design of bridges, chimneys and dams situated in seismic regions.

A more detailed outline of the material covered in the various chapters is:

1. An Overview of Earthquake-Resistant Design.

The challenge of earthquake engineering, the nature of the earthquake hazard and the effect of the site, characteristics of earthquake effects on structures, the aims of earthquake-resistant design, planning considerations, analysis for earthquake effects, detailing for earthquake resistance, the earthquake-resistant characteristics of reinforced concrete.

2. Choice of Earthquake-Resistant System.

Foundations, moment-resisting frames, shear walls, frame-wall or dual systems, coupled shear walls, special methods of improving earthquake resistance.

3. Analysis for Earthquake Effects.

Basic principles and types of seismic analysis, analysis of reinforced concrete structures.

4. The Behaviour of Reinforced Concrete under Cyclic Loading.

Behaviour of reinforcement, plain and confined concrete, beams, columns, beam-column and slab-column joints, shear walls and prestressed concrete, anchorage and splices, interaction of sub-assemblies in structures.

5. Design of Moment-Resisting Frames.

Preliminary and final sizing, determination of element strength, reinforcement detailing, frames not proportioned to resist lateral forces, frames of limited and ordinary ductility, flat slabs, precast and prestressed concrete frames, design of masonry infill panels.

6. Design of Shear Walls.

Preliminary and final sizing, design of compression edges, design strength, detailing considerations, design of openings, large panel precast systems.

7. Design of Diaphragms.

Current state of knowledge, seismic design requirements, preliminary and final sizing, strength, openings, precast diaphragms.

8. Codes of Practice for Building Structures.

US, NZ, Japanese and European codes and comparisons between them.

9. Soils and Foundations.

Soil properties for seismic design, site-specific hazards, soil-structure interaction, RC foundations in general, pad, strip and raft foundations, piles, retaining structures.

10. Base Isolation and other Means of Response Control.

Historical review, basic principles of seismic structural base-isolation, design of base-isolated structures, energy dissipators for base isolation, modelling and analysis, code requirements, examples, other forms of seismic response control.

11. Non-Building Structures.

Bridges, seismic design of RC chimneys, concrete dams.

Each chapter concludes with a list of references. The material is well presented and includes many diagrams, illustrations, photographs and tables.

This book represents the up-to-date state of the art. It should have a great appeal to both design practitioners and students of structural engineering interested in fundamental issues without wishing to get involved with many details of analysis. The main aim of the book is to help the designer of reinforced concrete structures in earthquake country to solve the particular problems arising from strong ground motions and the authors have succeeded in doing this.

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