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New Release

DISPLACEMENT-BASED SEISMIC DESIGN OF STRUCTURES

By M.J.N. Priestley, G.M. Calvi and M.J. Kowalsky

Displacement-Based Seismic Design of Structures is a book primarily directed towards practicing structural designer engineers who are interested in applying performance-based concepts to seismic design. Since much of the material presented in the book has not been published elsewhere, it will also be of considerable interest to researchers, and to students of earthquake engineering who wish to develop a deeper understanding of how design can be used to control seismic response.

The design philosophy is based on determination of the optimum structural strength to achieve a given performance limit state, related to a defined level of damage, under a specified level of seismic intensity. Emphasis is also placed on how this strength is distributed through the structure. Capacity design considerations have been re-examined, and new and more realistic design approaches are presented to insure against undesirable modes of inelastic deformation.

The book considers a wide range of structural types, including chapters on frame, wall, and dual wall/frame buildings, masonry and timber structures, bridges, structures with isolation or added damping devices, and wharves. These are preceded by chapters discussing conceptual problems with current force-based design, seismic input for displacement-based design, fundamentals of direct displacement-based design, and analytical tools appropriate for displacement-based design. The final chapters adapt the principles of displacement-based design to assessment of existing structures, and present the design information in the form of a draft building code.

This major new book (721 pages) is illustrated by copious worked design examples (39 in all), and analysis aids are provided in the form of a CD containing three computer programs covering moment-curvature and force-displacement analysis (Cumbia), line-element-based inelastic time-history analysis (Ruaumoko), and a general fibre-element analysis program (SeismoStruct), capable of static, dynamic, and pushover analysis.

The design procedure developed in this book is based on a secant-stiffness (rather than initial stiffness) representation of structural response, using a level of damping equivalent to the combined effects of elastic and hysteretic damping. The approach has been fully verified by inelastic time history analyses, which are extensively reported in the text. The design method is extremely simple to apply, and very successful in providing dependable and predictable seismic response.

The authors: Priestley has co-authored two widely used books on seismic design of buildings and of bridges, the latter of which Calvi is also a co-author. All three authors have been deeply involved, over the past fifteen years, in development of displacement-based seismic design.

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