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Seismic Analysis of Buildings Using Direct Displacement Based Design Method

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Introduction

1.1 General

Displacement-Based Seismic Design of Structures is a method primarily directed towards practicing structural designers who are interested in applying performance-based concepts to seismic design. It will also be of considerable interest to researchers, and to graduate and upper-level undergraduate 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. This takes two forms: methods of structural analysis and capacity design. It is shown that equilibrium considerations frequently lead to a more advantageous distribution of strength than that resulting from stiffness considerations.

During the last years, the conceptual framework of Performance-Based Design, PBD, has been largely developed. The definition of the performance design objectives in terms of expected levels of damage resulting from expected levels of earthquake ground motions has been proposed. Displacement-based design (DBD) methods are recognized as excellent options to use within a PBD due to the ability to predict structural damage states. An interesting number of DBD approaches have been developed over the last decades. These methods suppose that ductility and plastic rotation can be imposed to the structure and