

COMPARISION OF DIFERENT SIMPLIFIED METHODS FOR SEISMIC ASSESMENT OF CONCENTRIC BRACED FRAMES

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ABSTRACT

Besides the complex instructions of guidance documents for seismic rehabilitation of existing buildings, some institutions have provided simple criteria in terms of simplified rehabilitations.

ASCE 41-06 is one of documents that introduced a simple method for assessment of certain buildings that do not require advanced analytical procedures. Furthermore the New Zealand guideline has presented a simple lateral mechanism analysis that is a hand static analysis for determining the probable collapse mechanism, lateral strength and displacement capacity of the structure. In this study the accuracy of simplified methods is examined on samples of steel concentric braced frames. Next the PGA values that cause their collapse are determined and these results are compared with the corresponding values determined by Incremental Dynamic Analysis. After comparison of obtained results, suggestions are presented to improve seismic retrofit criteria.

INTRODUCTION

The simplified rehabilitation method is less complicated than the complete analytical rehabilitation design procedures found. In many cases, this method represents a cost-effective improvement in seismic performance, and often requires less detailed evaluation or partial analysis to qualify for a specific performance level. FEMA 178, the NEHRP handbook for the seismic evaluation of existing buildings, was the basis for the simplified rehabilitation method that different versions of it have been completed and new analysis techniques have been provided in ASCE 41-06.

Another guidance document for seismic assessment of existing buildings is NZSEE2006 recommendations in New Zealand. This guideline has proposed a hand analysis to determine the probable collapse mechanism, lateral strength and displacement capacity with simplified consideration of capacity issues, so this method was named simple lateral mechanism analysis (SLaMA). The behavior of the structure is reduced to that of an equivalent single-degree-of freedom system.

In this study, a hand static analysis for seismic evaluation of steel braced frames is presented by using of New Zealand guideline and ASCE 41-06 criteria .Three different special steel braced frames with different number of stories (4-8 and 12-storey) were assessed with the SLaMA approach.

At first, samples are assessed with the simplified methods proposed by the NZSEE and ASCE 41-06. After that, the nonlinear dynamic analysis was applied to assess the accuracy of seismic performance according to simple method (SLaMA). For this, frames have been analyzed under the action of 56 Near-Field earthquakes with the use of incremental dynamic analysis to determine the PGA values that cause their collapse. At the end these results have been compared by their similar values that were determined from the simple method.