



A REVIEW PAPER: PUSHOVER PERFORMANCE ANALYSIS OF CONCRETE STRUCTURES

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Abstract-The paper signifies a technique based on the conventional displacement method of elastic analysis, Push-over analysis of concrete structures and a simplified method for non-linear static analysis of building structures subjected to monotonically increasing horizontal loading.

Keywords: Design, elastic, pushover, stress

1. INTRODUCTION

1.1 Push-Over Performance Analysis of Concrete Structures

The paper presents a simple computer based push-over analysis technique for performance based design of building frameworks subjected to earthquake loading. The technique is based on the conventional displacement method of elastic analysis. The behavior model accounts for material inelasticity due to both single and combined stress states, and provides ability to monitor the progressive plastification of frame elements and structural systems under increasing intensity of earthquake ground motion.

In this paper, the significance of pushover analysis as an alternative to inelastic dynamic analysis in seismic design has been discussed. This paper has also presented a method for analysis of steel building frameworks subjected to equivalent-static earthquake loadings. The method accounts for first-order elastic and second-order geometric stiffness properties and the influences that combined stresses have on plastic behavior.

1.2 Proposed Push-Over Analysis

Conventional push-over analysis performed in the context of performance based seismic design is a computational procedure where, for static-equivalent loading consisting of gravity loads and monotonically increasing lateral loads, the progressive stiffness/strength degradation of a building frameworks monitored at specified performance levels. This paper helps to monitor the progressive stiffness degradation of a frame structure as it is loaded into the post elastic range of behavior. The post-elastic degradation of the flexural stiffness of a frame member begins when the material fibers farthest from the neutral axis of the cross-section experience initial yielding.

2. SIMPLIFIED PUSH-OVER ANALYSIS OF BUILDING STRUCTURES

In this paper, a simplified method for non-linear static analysis of building structures subjected to monotonically increasing horizontal loading (push-over analysis) is presented.

- The method is based on an extension of the pseudo 3 dimensional mathematical model of the structure into the non-linear range.
- In this paper, the mathematical model, the base shear-top displacement relationships for different types of microelements and the step by step computational procedure are described. By step by step analysis, an approximate relationship between the global base shear and top displacement is computed.

3. PSEUDO THREE DIMENSIONAL MATHEMATICAL MODEL

It consists of assemblages of two-dimensional macro elements (substructures) such as frames, walls, coupled walls and walls on columns that may be oriented arbitrarily in plane.

- Each macro element is assumed to resist load only in its own plane, but the building as a whole can resist load in any direction. The macro elements are connected at each floor level by diaphragms that are assumed to be rigid in their own planes and have no out of plane flexural stiffness.
- The proposed simple procedure for the push over analysis of building structures is capable to estimate several important characteristics of non-linear structural behavior, especially the real strength and the global plastic mechanism, and the design of earthquake resistant building structures and for evaluation of existing structures.

4. LITERATURE REVIEW

A brief review of available literature indicated that whereas important advancements have been made in the past decade or so, there are many fundamental issues still outstanding and even basic ingredient of the approach are not tackled. This leads to including a measure of spectral amplification in the procedure that would liberate it from restriction of providing one push over curve to fit all dynamic analyses under a variety of earthquake ground motion records.

R. HASAN. ET AL. (2002) performed push-over analysis for performance based seismic design. They studied a simple computer based design of building frameworks subject to earthquake loading. The technique is based on the conventional displacement method of elastic analysis.

A.S. ELNASHA (2001) used inelastic push-over analysis for earthquake applications. Critical issues in the application of inelastic static analysis were studied and their effect on the obtained results appraised. Areas of possible developments that would render the method more applicable to the prediction of dynamic response were explored.

VOJKO KILAR AND PETER FAJFAR (1998) They presented a simplified method of non-linear static analysis of building structures subjected to monotonically increasing horizontal loading. An approximate relationship between the global base shear and top displacement using a step by step analysis was computed. During the analysis, the development of plastic hinges throughout the building can be monitored.

5. RESULTS AND FINDINGS

Refer to the technical paper of “Static elastic and non-elastic Seismic analysis of a G+3 Earthquake Resistant RC frame structure.

6. PROBLEM FORMULATION

- The main aim of this study was to understand behavior of reinforced concrete framed structures by using non linear static procedure in finite element software “SAP2000”.
- In this study we performed push-over analysis on different multi-storeyed buildings. Results are compared and suitable remedy is suggested if any failure occurs.
- It concluded that the proposed procedure may be appropriate for practical analysis and design of earthquake resistant building structures and for evaluation of existing structures.

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