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Extension of modal pushover analysis to seismic assessment of bridges

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SUMMARY

Nonlinear static (pushover) analysis has become a popular tool during the last decade for the seismic assessment of buildings. Nevertheless, its main advantage of lower computational cost compared to nonlinear dynamic time-history analysis (THA) is counter-balanced by its inherent restriction to structures wherein the fundamental mode dominates the response. Extension of the pushover approach to consider higher modes effects has attracted attention, but such work has hitherto focused mainly on buildings, while corresponding work on bridges has been very limited. Hence, the aim of this study is to adapt the modal pushover analysis procedure for the assessment of bridges, and investigate its applicability in the case of an existing, long and curved, bridge, designed according to current seismic codes; this bridge is assessed using three nonlinear static analysis methods, as well as THA. Comparative evaluation of the calculated response of the bridge illustrates the applicability and potential of the modal pushover method for bridges, and quantifies its relative accuracy compared to that obtained through other inelastic methods. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS: bridges; seismic design; modal pushover

INTRODUCTION

Although elastic analysis provides a useful estimate of the expected dynamic response of a bridge, as a rule it cannot predict the failure mechanisms or the redistribution of forces that follow plastic hinge development during strong ground shaking. Nonlinear static (pushover)

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