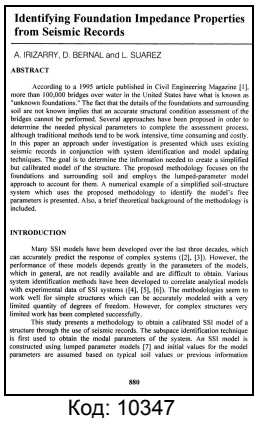
Identifying Foundation Impedance Properties from Seismic Records

A. IRIZARRY, D. BERNAL and L. SUAREZ

ABSTRACT

According to a 1995 article published in Civil Engineering Magazine [1], more than 100,000 bridges over water in the United States have what is known as "unknown foundations." The fact that the details of the foundations and surrounding soil are not known implies that an accurate structural condition assessment of the bridges cannot be performed. Several approaches have been proposed in order to determine the needed physical parameters to complete the assessment process, although traditional methods tend to be work intensive, time consuming and costly. In this paper an approach under investigation is presented which uses existing seismic records in conjunction with system identification and model updating techniques. The goal is to determine the information needed to create a simplified but calibrated model of the structure. The proposed methodology focuses on the foundations and surrounding soil and employs the lumped-parameter model approach to account for them. A numerical example of a simplified soil-structure system which uses the proposed methodology to identify the model's free parameters is presented. Also, a brief theoretical background of the methodology is included.

INTRODUCTION

Many SSI models have been developed over the last three decades, which can accurately predict the response of complex systems ([2], [3]). However, the performance of these models depends greatly in the parameters of the models, which in general, are not readily available and are difficult to obtain. Various system identification methods have been developed to correlate analytical models with experimental data of SSI systems ([4], [5], [6]). The methodologies seem to work well for simple structures which can be accurately modeled with a very limited quantity of degrees of freedom. However, for complex structures very limited work has been completed successfully.

This study presents a methodology to obtain a calibrated SSI model of a structure through the use of seismic records. The subspace identification technique is first used to obtain the modal parameters of the system. An SSI model is constructed using lumped parameter models [7] and initial values for the model parameters are assumed based on typical soil values or previous information

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Ключевые слова:

Содержание.