USING THE H/V SPECTRAL RATIO FORESTIMATING THE VULNERABILITYINDEX OF A URBAN AREA

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ABSTRACT

The subsurface topography and the dynamic specification of soils have important effect on the ground motion response. During the age of cities, the building have constructed by the different techniques, materials, styles and standard codes. The researches have shown that the buildings have different response to earthquake related of their materials and design rules. The soil layer specifications are recognizing by different geotechnical and geophysical methods, including geotechnical and geophysical as well as spectral ratio. Horizontal-to-vertical spectral ratio (H/V) of microtremore was introduced by Nakamura (1989). This method is very usable in site characterization studies due to its low budget and easy use. In this paper, it has presented a method for estimating the degree of vulnerability of structures using spectral ratio H/V. In a vulnerability study in the city of Shiraz, the predominant frequencies are derived for the different parts of the city. These data have used to define a coefficient of vulnerability for the earth. For this purpose, 11 different building such masonry, steel or concrete structures were selected. The main frequency and amplification of microtremor H/V spectral ratio for building has been obtained. Furthermore, the resonant frequency and amplification factor of the ground have been calculated. The vulnerability index of soil K_g and vulnerability of building K_b were defined. Comparison of these coefficients it was recognized a damage factor η of building during the earthquake. This parameter leads to a fast and inexpensive method for preparing a disaster program for an urban area. In this paper, the damage rate of different building at Shiraz City was obtained. In addition, the damage potential of all the city area was calculated.

INTRODUCTION

Several methods were used to identifythesoil layer properties. The conventional techniques, such as geophysics or boreholes are being used, however, these methods are too expensive and too much time is spending on the exploration and analysis of data.During last three decade, the H/V spectral ratios of microtremorwereperformedinmicrozonationstudies.Following,the researchers were relayed by several studies emphasizing the stability of the H/V ratios (Lermo and Chavez-Garcia 1994; Duval et al. 1995; Ohmachi and Umezono 1998, Bard 1999, Haghshenas et al., 2008,). Since then the estimation of the natural frequencies of the soil profiles from horizontal to vertical (H/V) spectral ratio by use of the single stations method has become common (Kudo 1995; Bard 1999). The use the H/V spectral ratio spreads very fast and the researchers attempted to use this method as a tool for site characterization programs. Moreover, some researchers used the H/V spectral ratio for engineering applications. For instant some researchersshowed the correlation between frequency and depth (ex. Ibs-Von Seht M. 1999; Parolai 2002; Hinzen, 2004, Mokhberi et al. 2013).

In order to identify the relationship between building damage and local site effect, Nakamura (1997)proposed the vulnerability factor K todisaster identification. Thevulnerability method is to start from the observed damage, by assessing the building collapse after different intensity earthquakes. Making reference to the Nakamura's approach which implicitly contains a vulnerability identify model.Based on observation of structure materials and damage leveland combining with the vulnerability index Kb, this paper proposed a new model for damage estimating and disaster management for urban area.