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EMPIRICAL CORRELATION BETWEEN SHEAR WAVE VELOCITY AND SPT TEST IN SOILS OF AHVAZ CITY

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Abstract

The shear wave velocity (Vs), as an important parameter in amplification studies, is usually obtained by performing wave propagation tests in the field. But it is often not economically feasible to conduct these tests at all the sites. Therefore, a reliable empirical correlation between Vs and SPT-N would be a considerable advantage. This paper presents the development of a reliable regression equation between Vs and SPT-N based on the results of Downhole and Multi channel Analysis of Surface Wave (MASW) tests. In Ahvaz city, the soil layers are mainly consisted of medium Silty Clay, stiff Clay and medium Sand with thicknesses varying from a few meters to 10m. The MASW tests results were compared with other tests. An empirical correlation between Vs and SPT-N was developed. The regression equation developed in this study was compared with some other correlations and exhibits good predictions. It can be used for sites which predominantly consist of very medium to very stiff clay and very medium to dense sand.

Keywords: Shear wave velocity, Soil Stiffness, SPT, MASW, Ahvaz

1. INTRODUCTION

Strong motions locally observed at a specific site induced by a large earthquake are well known as the site effect caused by the weakness in physical properties of surface soft sediments. The major factor which controls the site effect is the shear wave velocities of the surface sediments. Knowledge of accurate and realistic dynamic characteristics such as shear wave velocity and other related dynamic soil properties like shear modulus, damping ratio etc. is an essential requirement in the analysis of seismic wave propagation. Prediction of the ground shaking response at soil sites requires knowledge of the stiffness of the soil, expressed in terms of shear wave velocity (V_S), which is measured at small strain levels by in-situ seismic methods as well as laboratory test methods. While it is preferable to determine V_S directly from field tests, it is often not economically feasible at all sites. Therefore, a reliable correlation between Vs and penetration resistance would be a considerable advantage, reducing the number of field verifications required. Although a quite number of empirical correlations between V_S and SPT-N values are available, but they are region specific and are not applicable to all regions.[1]

2. LITERATURE REVIEW

The most useful method for obtaining Vs30 measurements is through borehole logging. The PS suspension logging method directly measures accurate and high-resolution S-wave profile and has been widely utilized in Japan, [2]. However, the high cost of borehole drilling has driven the alternative methods for estimating Vs30 values. One of the easiest ways to estimate them is to use an empirical relationship between N-values of SPT (Standard Penetration Test) and S-wave velocities, [3]. Numerous relations between SPT blow count, *N*, and Vs30 exist in the literature (Table 1) [4]. Early efforts utilized laboratory results to develop relations, which were subsequently refined as field measurement of Vs30 became popular and more data became available. The early correlations based on field data often involved blow counts that were not corrected for energy, rod length, or sampler inside diameter. Hence, it is impossible to know whether bias is introduced by