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Ground shaking characteristics and soil condition in high potential zone of liquefaction

T. Enomoto(1), M. Navarro(2), T. Yamamoto(1), T. Matsuzawa(1), S. Yamada(3)

(1) University of Kanagawa, Yokohama, Japan, (2) University of Almería, Almeria, Spain, (3) Kitac Co. Ltd., Niigata, Japan. enomot01@kanagawa-u.ac.jp

Ground shaking characteristics are very sensitive in the relation to the soil conditions in shallow and deep underground conditions. Also the underground conditions are strongly influenced by the formation and process of geological settlement. From the point of view of seismic disaster prevention, many mega-cities in Japan are located near the mouth of big rivers and developed in bay areas with artificially reclaimed land. These areas are very vulnerable for the liquefaction phenomena because of very soft soil, especially constituted by fine, loose, sandy soil layer with high underground water level. In 1964, Niigata Earthquake (M = 7.5) was occurred at just front of Niigata coast in Japan Sea. Niigata City is located at the mouth of Shinano River and seriously damaged due to the 1964 Niigata Earthquake. After the Niigata Earthquake, the liquefaction phenomenon was famous in the world and important investigation for the seismic resistant consideration in civil engineering and building structural design. Recently, many information about the soil conditions in this area were accumulated and investigated the underground structures. So, we tried to observe the microtremors at many sites in liquefied area in 1964 Niigata Earthquake in order to understand the ground shaking characteristics in high potential of liquefaction area and compare the ground shaking characteristics in no potential of liquefaction area. Also, we checked the ground shaking characteristics by strong motion records observed by k-net system in Japan. In general, the soil condition in Niigata City, the deep sandy soil layer is covered the top surface and there are not existed the clear contrast in the surface soil conditions. Then the SPT value is increasing gradually to deeper sandy layer and this is the very different in the soil conditions of other urbanized areas. We did the three types of microtremor observations in Niigata City, the first one is the continuous fixed site observation within 3 weeks, the second one is the short distance interval moving

observation at about 100 sites and the third one is the long distance moving measurements at 2 line. The result obtained from the continuous observation shows that the amplitude of microtremors were very changeable between daytime and nighttime and also the predominant period obtained from H/V spectra were different depending on the time and the periods were longer in the daytime, about 0.7 - 0.9 sec, and were shorter in nighttime, about 0.4 - 0.5 sec. This means that the top surface sandy soil layer is constituted so soft soil condition and is very excitedly vibrated by the transporting vehicles. In this case, the characteristics of H/V spectra is not so clear because of the big influence of vertical component and the characteristics of Fourier Spectra are more applicable in the evaluation of shaking characteristics of surface ground in the areas where are no clear contrast existence. From the results of short and long distance moving observation, it's appeared the big difference in predominant period on Fourier Spectra along to the observation line and it's related the depth of soft sandy soil layer and existence of different soil materials at inundation areas. Finally, the characteristics of strong motion observation records are indicated very similar tendency with the characteristics of microtremor observation records. We must investigate the applicability of microtremors for the evaluation of ground shaking characteristics in high potential liquefaction areas considering the difference of soil conditions, especially the existence of contrast between the soft surface sediment layer and the soil layer responded to be a basement layer.