COMPARISON OF VARIOUS SLIDING BEARINGS UNDER NEAR FAULT GROUND MOTIONS

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ABSTRACT

In recent years, the damages to the well-designed structures, caused by earthquakes, has attracted the attention of engineers to use seismic isolation systems such as sliding bearings. The seismic responses of conventional fixed base and isolated systems will be amplified in near fault ground motion due to its long period. Herein, the behaviour of a seismically isolated structure mounted on various sliding bearings is investigated under real ground motions, then the effects of isolation's period on seismic responses of structure is studied. The numerical results show that the normalized base shear and superstructure's acceleration are reduced significantly and can be controlled within a desirable rang with the installation of sliding bearings. It is also found that the VFPI has better performance compared to other sliding bearings. In addition, increasing the isolation's period leads to decreasing the normalized base shear.

INTRODUCTION

Base isolation is one the most effective methods of reducing the induced damages and responses of structures during earthquake. Among different types of seismic isolation devices, the friction-type base isolator are highly popular and used specially in vital structures such as bridges and liquid storage tanks since its period does not depend on the weight of the mounted structure during earthquake. This type of isolator is also relatively insensitive to variations in the frequency content and amplitude of the input excitation (Mostaghel and Tanbakuchi, 1983).

The first generation of Friction Pendulum System (FPS) was introduced by Zayas et al. in 1987 (Zayas et al., 1987). FPS uses the gravity action to supply restoring force, containing of a spherical stainless steel surface to dissipate energy and re-centring the isolator after occurred movement during earthquake.Fig. 1 shows the cross section of FPS.Since the sliding surface of FPS isolator is spherical, its time period of oscillation remains constant.

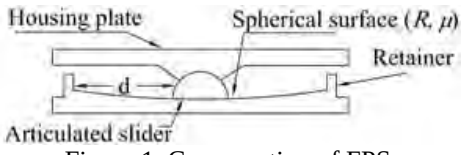

Figure 1. Cross section of FPS

Unfortunately, the uses of spherical sliding surface results in several practical disadvantages. One of these disadvantages is that FPS needs to be designed for a specific level of ground excitation amplitude which leads to reduce its efficiency under broad range of ground motions(Pranesh and Sinha, 2000).

In recent years, several studies and experimental researches have been done to improve the seismic