VARIABLE BAFFLES TUNED LIQUID DAMPER FOR SEMI ACTIVE CONTROL OF ONE DEGREE OF FREEDOM STRUCTURES

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Earthquake causes human fatigue and injury. In addition, it results in structural damage, lowering the strength and safety of the structure. Semi-active systems with variable stiffness and damping have demonstrated excellent performance in migrating these effects and improving seismic response of building (Chiristenson, 2001). These devices are capable of offering the adaptability of active devices and stability and reliability of passive devices (Housner et al.,1997). The semi-active damping devices can vary their damping characteristics without large power source, and can improve seismic response of building. Variable Baffles Tuned Liquid Damper (VBTLD) with variable damping is a suitable device for semi-active seismic response control of the structures (Zahrai et al., 2011). TLD (Tuned Liquid Dampers) is generally tuned to the main frequency of the building and is less efficient in other frequencies while using the rotatable baffles compensate this problem. Also by adding the baffles, TLD becomes more controllable, i.e. a semi-active damper (Zahrai et al., 2011).

In this paper, experiments have been conducted to establish the behavior of the VBTLD. A damper made up of Plexiglas was built on a one degree-freedom model (Figure 1). In this study, period of the structure is about 1 second which is between the values of fluid ‘s period in open and closed-baffles.

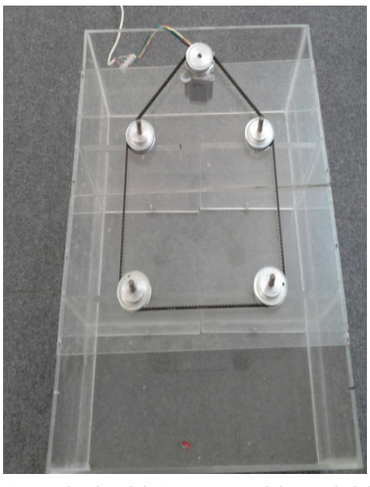

Figure 1. Tuned Liquid Damper with Variable Baffles

Figure 2. One degree of freedom model for testing on shake table

The damper was tested under harmonic excitations on the shake table. In this research 20 harmonic excitation with different frequencies have been applied. Through the experiments the value of the mass ratio, which is the ratio of the mass of water to that of structure, is considered 4 percent (Banerji et al., 2000). Results reveal that the damping ratio depends on the frequency of excitation. Also due to rotation of the baffles, VBTLD is efficient in a specific range of frequencies and not a determined frequency.

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