



Study of dampers behavior under seismic loading

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Abstract

Modern urbanism, the severe limitations of space construction and the high price of land and some races, has transformed cities view and caused buildings, residential and commercial growth in vertical aspect. Therefore, vibration control of such structures seems necessary in order to provide comfort and prevent escalation criteria. In this paper different damping instruments are explained and compared.

Keywords: damper, seismic loading, structure

1. INTRODUCTION

Modern urbanism, the severe limitations of space construction and the high price of land and some races, has transformed cities view and caused buildings, residential and commercial growth in vertical aspect. Therefore, vibration control of such structures seems necessary in order to provide comfort and prevent escalation criteria. [1]

On the other hand, in the communication towers a huge part of their mass is concentrated on top of the structure as inverted pendulum. Thus, controlling the structure is necessary, due to avoid disruption of sending and receiving communicational messages. It is necessary to control vibrations in suspension bridges due to the convenience of users.

The cables are critical structural members having a length about 500 m and also having natural frequencies of about 0.2 to 2 Hz in the lowest modes.

Damping of these structures is about 0.1% of critical damping, and this can cause vibration of the active forces.

Therefore, it is necessary to set up methods to control the vibration effects. One of the mentioned methods is to increase the stiffness of the structure, but definitely it will cost too much. The next important factor is the damping effects of the structure which can absorb energy and dissipate the energy.

They have performed many investigations on this topic to control the structure, and proposing different instruments. [1]

The John Hancock Building in Boston and the Center Citicorp in New York have been used tuned mass dampers (TMD).

These dampers were first proposed by Frahm in 1909. It was developed in 1928 by Ormondroyd. In late 1960, Baying et. al investigated the dynamic aspects of liquid dampers. Some advantages of this dampers are: low price, easy installation, easy repair and maintenance.

Two main groups for dampers are TLD and TLCD which will be discussed more. in recent years, too mush researches are performed on variable TLCD which is called LCVA which are more compatible with architectural criteria.

The main difference is due to non-uniform shape of area section in LCVA dampers. Based on Chang 1999 researches, the performance of LCVA in structural vibrational controlling is between TMD and TLCD. [3]