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Project Report on

Validation and Demonstration Models for Dynamics of Multi-storey Frames

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BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

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SYNOPSIS

There has been a recent trend towards utilizing damping system to reduce building accelerations, motion, or deflections. Traditionally, structural engineers and designers concentrated their design efforts on the more tangible properties of stiffness and mass . The balancing of these properties usually produced an efficient design, capable of allowing the architect the freedom to achieve a desired aesthetic and the structural engineer could limit deflections and stresses. There has been a recent trend towards utilizing damping systems to reduce building for a safe structure. Given the desire to build higher buildings,longer bridges and more daring structures,the envelope of what is possible within conventional structural design imposes limitations. Advances in materials, such as high strength steels and efficiencies in structural design through the use of advanced 3-D modelling software, produce designs which may have unexpected deficiencies. Taller, longer, and lighter structures tend to be more sensitive to wind-induced vibrations or vibrations due to earthquake, traffic, etc. This has led engineers and architects to turn to the damping of a structure as a means of limiting excessive motions/deflections.Traditionally, there have only been a few methods of increasing the damping of a structure. Research in vibration suppression has led to a large number of different types of damping systems, each employing different technological advances.

Damping is one of many different methods that have been proposed for allowing a structure to achieve optimal performance when it is subjected to seismic, wind storm or other types of transient shock and vibration disturbances. A graph of time vs amplitude shows gradual decrease in amplitude as time increases under free vibration of structure. The damping ratio is a parameter, usually denoted by ζ (zeta), that characterizes the frequency response of a second order ordinary differential equation. The damping ratio can be defined as the ratio of the damping coefficient to the critical damping coefficient.

There is a need for developing si mple models to show dynamic behavior of Structures .Simple methodology is adopted for demonstrating sophisticated structural dynamic phenomena to validate the measured frequencies with theoretical analysis.In this study an effort is made to determine damping coefficient by logarithmic decrement method with a simple experiment. Logarithmic decrement can be generated by an arrangement made to plot the graph of free vibration of the structure either using a paper stuck on a rotating drum controlled by an electric motor. Successive two peak amplitudes of the graph are used to calculate the damping coefficient of the structure using logarithmic decrement formula. Thus determining damping ratio(ξ).

Simple polycarbonate sheets are used as columns in modeling a two dimensional multi storeystructure , polycarbonate sheets are very convenient because of their flexibility. Basic elastic properties of polycarbonate sheets are determined experimentally. Experimentally measured frequencies are validated with theoretical analysis. Also different mode shapes are generated by exciting the structure manually.Thus Modelshelp us in demonstrating dynamics of structures without using expensive hardware.