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Permeable Pavement On Stormwater Runoff Sustainable Urban Drainage System

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***Abstract**:*

Structural control is one area of current Research that looks promising in attaining reduce structural vibrations during loading such as earthquakes and strong winds. There are three primary classes of supplemental damping devices, categorized into three corresponding control strategies. The first class of supplemental damping devices is passive. Passive devices are non-controllable and require no power. The second class of supplemental damping devices is active. Active devices are controllable, but, require significant power to operate. The third class of supplemental damping devices is semi active. Semi active devices combine the positive aspects of passive and active control devices in that they are controllable but require little power to operate. In seismic structures upgrading, one of the lateral force reduction caused by the earthquake is use of dampers. During an earthquake, high energy is applied to the structure. This energy is applied in two types of kinetic and potential to structure and it is absorbed or amortized. If structure is free of damping, its vibration will be continuously, but due to the material damping, vibration is reduced. on the seismic performance of building structural systems having passive damping devices installed within frame. The study of the main objective to check performance of building when designed as per Indian Standard. The building will be analyze is G+25 R.C framed building of symmetrical rectangular plan configuration for zone IV. Response Spectrum Method of seismic analysis will be used. The paper gives the study of different literature investigation taken on effect of different types of dampers in design of high rise building for dynamics loads.

Keywords
Dampers, high rise building, dynamics loads.

1. Introduction

In recent years due to development of design technology and material qualities in civil engineering, the structures (high rise buildings, long span bridges) have become more light and slender. This will cause the structure to develop the initial vibrations. These vibrations may lead to serious structural damage and potential to structural failure. Civil structures also fail during large seismic events, often resulting in loss of human life and damage property. Structural vibration control, as an advanced technology in engineering, consists of implementing energy dissipating devices into structures to reduce excessive structural vibrations(due to dynamic loads), to prevent catastrophic structural failure and enhance human comfort because of natural disturbances like strong earthquakes. In early 1990s, considerable attention has been paid to research and development of structural control devices, and medium and high rise structures have begun implementing energy dissipation devices or control systems to reduce excessive structural vibrations. Structural control is a diverse field of study. Structural control is one area of current Research that looks promising in attaining reduce structural vibrations during loading such as earthquakes and strong winds. There are three primary classes of supplemental damping devices, categorized into three corresponding control strategies. The first class of supplemental damping devices is passive. Passive devices are non-controllable and require no power. The second class of supplemental damping devices is active. Active devices are controllable, but, require significant power to operate. The third class of supplemental damping devices is semi active. Semi active devices combine the positive aspects of passive and active control devices in that they are controllable (like the active devices) but require little power to operate.

A. Conservation of Energy-

In seismic structures upgrading, one of the lateral force reduction caused by the earthquake is use of dampers. During an earthquake, high energy is applied to the structure. This energy is applied in two types of kinetic and potential (strain) to structure and it is absorbed or amortized. If structure is free of damping, its vibration will be continuously, but due to the material damping, vibration is reduced. Input energy caused by earthquake to structure is presented in the following equation:

$$E = E_K + E_S + E_h + E_d$$

Where,
E = earthquake input energy
Ek = kinetic energy
Es = reversible strain energy in the elastic range
Eh =the amount of wasted energy due to inelastic deformation
Ed =the amount of amortized energy by additional damper

B. Behaviour of Dampers Provided in High Rise Building -

Friction Dampers In this type of damper, seismic energy is spent in overcoming friction in the contact surfaces. Among other features of these dampers can be classified as avoiding fatigue in served loads(due to the non-active dampers under load) and their performance independent to loading velocity and ambient temperature. These dampers are installed in parallel to bracing. Viscoelastic Damper Viscoelaspers The typical viscoelastic damper consists of viscoelastic layers bonded with steel plates or solid thermoplastic rubber sheets sandwiched between steel plates .The viscoelastic solid materials are used as a means to dissipate energy in viscoelastic dampers. The viscoelastic materials generally used are co-polymers or glassy substances .The energy is dissipated through shear deformation of the viscoelastic layers. Its behavior depends upon vibration frequency, strain levels and temperature. While in active state, the relative motion between central and outer plates gives rise to shear deformations in the viscoelastic fluid between these interfaces and consequently the energy is dissipated leading to seismic response mitigation.

Mass damper Mass is placed on a fulcrum which acts as a roller. And it allows to mass with move as a transfer-lateral movement to the floor. Springs and dampers are placed between mass and anchor members to the floor and frame and they are placed relative in “opposite phase” and sometimes are adjacent vertical. And these anchor members transmits structural lateral force. Bidirectional transfer dampers are made as a spring-damper in two vertical directions. And they provide controlling the structure movement in two vertical structures.

2. Scope And Objectives

The main aim of this project is to generate fundamental research information on the seismic performance of building structural systems having passive damping devices installed within frame.Create computer models of building with and without damper systems for investigation.Study the effect of important parameters such as damper properties, locations and configurations of the dampers.Use the research findings to propose more effective damping system for seismic mitigation.

3. Literature Review

There have been numerous papers and books published regarding base isolation of structures. However, the three –dimensional performance of these structures has been generally overlooked in the literature.

Alireza Heysami(2015)

This paper investigates types of dampers and their performance during earthquake. Also, they have investigated the tall buildings in the world and satisfactory level of damper performance has been studied. And the results show that no only dampers have an acceptable seismic behavior against lateral forces such as wind and earthquake forces. But it has reduced construction limitations of multi-storey building.

Mr. Muralidhara G B

Mr. Naranagowda, Mrs. Swathi Rani K S (2015)Vibrations due to natural dynamic loads generated by earthquake. The reducing of structural vibrations occurs by adding a mechanical system that is installed in a structure called Dampers .In this paper, the vibration control of multi degree of freedom (MDOF) buildings connected with selected types of dampers due to earthquake effect is studied. The application of Viscous and Semi active variable friction (SAVFD) damper for response control of seismically excited building is evaluated. Both dampers effectiveness is investigated in terms of the reduction of structural responses (displacements and accelerations) of the connected to building.

Alireza Farzampour, Arash Kamali (2017)

The behavior of structures in recent years indicates that moderate and severe earthquakes lead to substantial damages, extensively higher than what is expected. One solution in order to reduce the seismic response of the structures, especially in relative story displacements is usage of tuned mass dampers (TMD).

Priyanka S.Ghodke, Prof. G. R. Patil (2015) Conventional methods of seismic rehabilitation with concrete shear walls or steel bracing are not considered suitable for some buildings as upgrades with these methods would have required expensive and time consuming foundation work. A number of techniques and devices have been proposed, tested and successfully installed in structures for seismic protection.

4. Future Scope

The present study is based on comparison of three types of dampers are in RC structures. Later these dampers can be introduced in structures along with shear wall and bracings. This work can be further extended to design the same buildings and compare the concrete quantity and steel quantity. For further experimentation, a relation can be established between the strength and stiffness along with the economic structure. Also same study can be carried out for steel and composite structures.

5. Conlusion

On the basis of present study , following conclusions can be drawn:

Seismic performance of building after application of damper is much better when we provide in outer perimeter of structure.

Application of multiple tuned mass damper reduces large amount of displacement of the structure than viscoelastic and friction dampers.

Due to absolute displacement reduction the structure have not require more ductility to resisting earth-quake forces.

With the using of multiple tuned mass damper in the structure, the base shear slightly increases as compared to visco elastic and friction dampers.