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Effects of the different types of materials used in passive vibration control systems for structures.

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Problematic

The construction of structures (buildings, bridges, ... etc) is more and more complicated, it is for this reason, their design requires the satisfaction of an increasingly large number of constraints (type of materials, measurement security, control systems, ... etc). Indeed these structures very often work in hostile environments and they are subjected to dynamic loadings which induce unwanted vibrations. These vibrations produce instabilities and maybe even the destruction of these structures.

Goals

The concept of control of structures appeared to solve these problems and having for objective the control of the responses of the systems to minimize the effects, which can be catastrophic, in particular, in the case of an earthquake. this is why we must consider the component materials of vibration control as being an integral part of the design of these structures.

Processing method

In this work we did a detailed bibliographic research on the different types of materials used in passive vibration control systems of structures; Base isolation systems, energy dissipation systems. So that to give a more complete vision in the field of civil engineering to protect the works.

This work includes an introduction, two categories of passive systems with a general conclusion: After this introduction, where I give the different types of control systems and the history of their use, I explain in the first category is devoted to a brief overview on basic insulation systems: Elastomer insulator with lead core (LRB), Elastomer insulator with low damping rate, Elastomer insulator with high damping rate, Slip-based systems.

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In the second category, I present the main energy dissipation systems:

Friction dampers, Metal dampers, Viscoelastic dampers, Viscous fluid dampers, coupled inertial systems.

Expected or obtained results

The control of structures is a technique which allows the engineer to control the response of a structure under seismic excitation and provides a response adapted to each applied stress and makes it possible to adapt their behavior according to changes in their environment.

Buildings constructed with traditional earthquake-resistant know-how have withstood better, on the other hand, buildings constructed with the installation of reliable control systems are durable and more resistant to shaking.

From what we saw in our theoretical study, great progress has been made during the two decades spent on innovative technologies in the field of control such as energy dissipation devices and insulation based. Energy dissipation devices and shock absorbers have a very large effect in reducing potential damage to buildings by absorbing a significant amount of the energy produced in structures during an earthquake. We can therefore confirm that the insulation at the base is a technical solution which can attenuate the significant accelerations of the ground and the movements between the floors of a building.