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Linear time history analysis of moment frames using Translational tone mass damper theory

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Abstract

A Tuned Mass Damper (TMD) is a device consisting of a mass, a spring, and a damper that is attached to a structure in order to reduce the dynamic response of the structure. The frequency of the damper is tuned to a particular structural frequency so that when that frequency is excited, the damper will resonate out of phase with the structural motion. The aim of this study is to calculate the moment frames responses to a harmonic base excitation and its extension to provoke an earthquake or any arbitrary incitement using Fourier transform and translational dampers tone mass **(**TTMDs) theory. The computational cost of the proposed method is less than the conventional dynamic analysis methods and the accuracy of the results could be improved by verifying with valid test results. TMDs are commonly used to control the dynamical response of a main structure, but in this study, the TTMDs theory is used for analyzing the structure. Each floor include the above stories mass and all the floors above it are considered as the main one degree of freedom structure and it's corresponding translational tone mass damper respectively. Considering the code displacement constraints, optimization techniques can be applied in order to achieve the best distribution of stiffness and damping at the height of the structure (additional dampers may be installed in certain stories). Easy to implement, when the engineer uses from typical sections for the number of members, this issue should be taken into consideration.

Key words: steel moment frames, Linear time history analysis, Translational tone mass damper, multiple-degree of freedom structures