

## The Comparison of the Influence of Different Tuned Mass Dampers in Vibration Control of the Structures Using TMD Efficiency Equation

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### Abstract

The design of a tuned mass damper (TMD) system includes the calculation of the TMD mass on the basis of the mass ratio and computation of the TMD stiffness on the basis of the optimum frequency ratio and determination of the TMD damping coefficient according to optimum damping ratio of the TMD. For finding the optimum tuning parameters of a TMD, several studies have been accomplished so far, which among them, seven studies are more significant. But the discrepancy in the contents of the proposed equations leads to the design of TMDs with different characteristics. For response to this question that, which of these TMDs is more effective in vibration control of the structure, the issue of study on TMD efficiency turns to a disputable issue. In present paper, using these different proposed equations, the various TMDs have designed proportional to the needs of 15-storey and 20-storey MRF structures. The comparison of the results has resulted in derivation of an equation for the TMD efficiency. The results show that, the efficiency function has direct proportion with the ratio of the (TMD damping ratio) to (optimum frequency ratio). In fact, TMD efficiency is a linear function of above-mentioned ratio that, in which, proportion coefficient has reverse relation to the natural frequency of the structure. In other words, the proportion coefficient of the efficiency equation has direct relation to the fundamental period of vibration of the structure.

**Keywords:** TMD, efficiency, damping ratio, frequency ratio, vibration control.