Study on Optimum Damper Yield Strength Based on Transfer Function of Equivalent Linear System for R/C Structure with Hysteretic Damper

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Abstract

The aim of this study is to clarify optimum damper parameters for passive control design on reinforced concrete building structures with hysteretic dampers when subjected to strong earthquake motions. In the present paper, to approximate the nonlinear displacement-dependent restoring force characteristics of reinforced concrete frames and hysteretic dampers, equivalent linear SDOF systems, which have two complex stiffness elements, are used. Optimum damper parameters to maximize multiplying factor of input ground motion subject to constant maximum response displacement ductility ratio are investigated based on peak values and weighted root mean square values of the transfer functions of the equivalent linear systems. Consequently, a simple expression of the optimum damper yield strength ratio has been derived. Proposed modified equations for estimating optimum damper parameters have been verified by comparing with parametric nonlinear time history earthquake response analyses.