Postprint of Analysis on Damping and Response Characteristics of Displacement-Based Mild Steel Dampers

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Abstract

Based on the bilinear mild steel damper model, the equations of motion for a single-degree-of-freedom structure-displacement type mild steel damper system were established, the structural response under free vibration was solved piecewise, the analytical solutions for displacement, vibration amplitude, and period of the first vibration cycle were derived, recursive expressions for the vibration amplitude between cycles and period expressions for arbitrary cycles were established, approximate solutions for the amplitude and period of each vibration cycle were obtained, and verification was conducted through simulation analysis. The results indicate that when the initial displacement exceeds the yield displacement of the mild steel damper, the amplitude decay between two vibration cycles is approximately identical, the periods of each vibration cycle are also approximately equal, and the approximate solutions are essentially consistent with the analytical solutions; only when the amplitude gradually decreases and approaches the yield displacement do certain errors emerge between the approximate and analytical solutions for amplitude and period.

Full Text

Preamble

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