

Evaluation of Seismic and Wind Resistance of a Low-Rise Masonry Building

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Abstract:

Many low-rise masonry buildings were designed following a set of empirical rules with little, if any, consideration of the expected loads. These empirical design provisions were simple to apply and provided a cost-effective design solution for low-rise masonry structures. Although believed conservative, empirical design provisions have resulted in many modern masonry structures that have exhibited poor structural performance during natural disasters. In this research, the adequacy of empirically designed structures was evaluated by comparing the available resistance to the required capacity determined from a rigorous load analysis of seismic and wind effects. Typical modern low-rise masonry buildings located in Memphis, Tennessee (moderate seismicity and minimal wind speeds) and Tampa, Florida (low seismicity and high wind speeds), were investigated. The building was designed in accordance with both the empirical and engineered design provisions given in the *Building Code Requirements for Masonry Structures* (ACI 530-92/ASCE 5-92/TMS 402-92). It was determined that the empirical design provisions provide insufficient capacities to meeting the minimum load requirements of the seismic and wind provisions of the *Minimum Design Loads for Buildings and Other Structures* (ASCE 7-93). Based on the findings of this research, recommendations are given to limit the application of empirical design provision for masonry structures.

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