

ANALYSIS OF THE TORSIONAL EFFECTS INDUCED BY THE SEISMIC ACTION IN PLAN ASYMMETRIC STRUCTURES

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Structures characterized by non coincident centre of mass and centre of stiffness (eccentric structures) when subjected to dynamic excitation, develop a coupled lateral-torsional response that may increase the local peak dynamic response. This behaviour has been investigated by many researchers since the late 1970s. Nevertheless a number of issues still remain unresolved in the areas of inelastic response and development of simplified, yet physically-based design procedures. In particular, in order to effectively apply the Performance-Based Design approach to seismic design, there is a growing need for code oriented methodologies aimed at predicting deformation parameter.

Starting from the governing equations of motion of linear elastic eccentric systems, a key system parameter which controls the maximum rotational response of such systems under free and forced vibration, is identified. This parameter, called ALPHA, is defined as the mass radius of gyration of the structure multiplied by the ratio of the maximum rotational to the maximum longitudinal displacement response developed by a one-story eccentric system in free vibration. A number of numerical, experimental (through shaking table tests of linear elastic and inelastic systems) and field data (from historically recorded structural responses) analyses have shown that the parameter ALPHA is capable of providing a tight upper bound for the maximum rotational response developed by the eccentric systems starting from the knowledge of the maximum longitudinal response of the “equivalent” non eccentric system.

Total number of publications: 35.

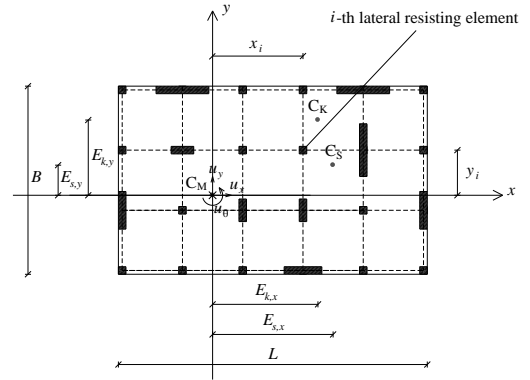


Fig. 1. Plan asymmetric structure (Silvestri).

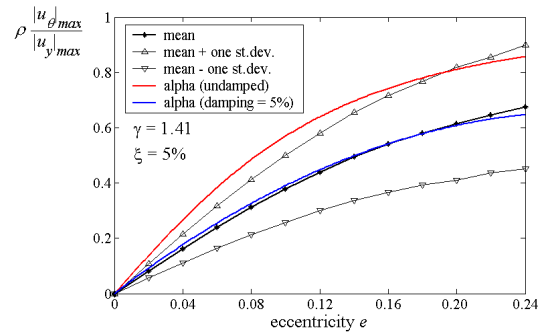


Fig. 2. Predictive capabilities of the ALPHA parameter (Silvestri).

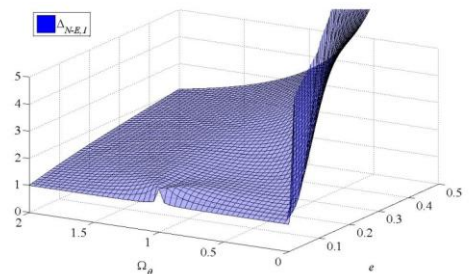


Fig. 3. Maximum corner displacement magnification with respect to centre mass displacement of the centre mass displacement of the equivalent non-eccentric system (Silvestri).

MAIN PUBLICATIONS

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RESEARCH PROJECTS

Research project RELUIS Line 2: "Evaluation and reduction of vulnerabilità of existing RC buildings." (Executive Project 2005-2008); National Coordinators: Prof. E. Cosenza and Prof. G. Monti; Chief-Responsible for the Bologna Research Unit: Prof. A. Benedetti.

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