14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19- 24, 2020, Paris, France

ASSESSMENT OF THE EFFECTIVE RESPONSE OF SEISMICALLY ISOLATED STRUCTURAL SYSTEMS

900 - STRUCTURAL MECHANICS, DYNAMICS AND ENGINEERING

FELICE C. PONZO*, ALBERTO PAVESE†,
ANTONIO DI CESARE* AND MARCO FURINGHETTI†

* University of Basilicata – School of Engineering
Viale dell'Ateneo Lucano 10 – Potenza
felice.ponzo@unibas.it, antodice@yahoo.it

† University of Pavia – Civil Engineering and Architecture Department
Via Ferrata 3 – Pavia
a.pavese@unipv.it, marco.furinghetti@unipv.it

Key words: Reliability analysis, Uncertainty evaluation, Seismic isolation and dissipation, Isolation and damper devices.

ABSTRACT

Seismic isolation systems provide a significant reduction of the structural vulnerability of both buildings and bridges subjected to earthquake excitations. The implemented devices provide a low value of global lateral stiffness, which leads to the proper period elongation and, consequently, the reduction of inertia forces at all levels is ensured. On the other hand, high displacement demands can be achieved at the isolation layer: such a displacement value can be reduced, by increasing the dissipative capacity of the implemented devices. Nowadays a number of technical solutions are used in the common practice: among the others, Concave Surface Slider devices and Rubber Bearings with & without lead core are generally adopted. In the design phase the main characteristics of isolation devices are computed, according to simplified procedures, which consider the mean values of mechanical properties as deterministic parameters, even though research and commercial experimental campaigns have highlighted a certain variability. Consequently, mechanical properties of isolation devices, considered as random variables, could eventually lead to unexpected responses, in comparison to the reference case, with deterministic parameters. Furthermore, the behaviour of isolation devices is not well known, according to the available research, when extreme loading conditions are applied, with displacement demands higher than the design value. Since in extra-stroke conditions the behaviour of isolation devices is unknown, the design displacement is generally considered as the collapse demand, and no further capacity is modelled. This aspect leads to unrealistic risk assessment of seismically isolated structural systems, which seem to experience a lower level of seismic rick, if the fixed-base configuration is analyzed, thanks to a number of safety reduction factors for strength and strain capacities of materials. The proposed mini-symposium represents a special occasion to share recent advances and research on the aforementioned topics.

REFERENCES

[1] M. Furinghetti, A. Pavese, V. Quaglini, P. Dubini, "Experimental Investigation Of The Cyclic Response Of Double Curved Surface Sliders Subjected To Radial And Bidirectional Sliding Motions", Soil Dynamics and Earthquake Engineering, Vol. **117**, pp. 190-202, (2019).

[2] S. Barone, A. Pavese, G.M. Calvi, "Experimental dynamic response of spherical friction-based isolation devices", Journal of Earthquake Engineering, DOI: 10.1080/13632469.2017.1387201, (2017).

[3] L. Ragni, D. Cardone, N. Conte, A. Dall'Asta, A. Di Cesare, A. Flora, G. Leccese, F. Micozzi, C. Ponzo, "Modelling and Seismic Response Analysis of Italian Code Conforming Base-Isolated Buildings", Journal of Earthquake Engineering, Vol. **22**(2), pp. 198-230, (2018).

[4] F.C. Ponzo , A. Di Cesare, G. Leccese, D. Nigro, "Shake table testing on restoring capability of double concave friction pendulum seismic isolation systems", *Earthquake Engineering And Structural Dynamics*, Vol **46**(14), pp. 2337-2353, (2017).

[5] A. Di Cesare, F.C. Ponzo, A. Telesca, D. Nigro, M.G. Castellano, S. Infanti, S. Fichera, B. Biondi, "Modelling of the over stroke displacement of curved surface sliders using opensees", *Proc. of First Eurasian Conference on OpenSees*, Hong Kong , 20-21 June 2019.