Base Isolation: Technologies for a Sustainable Environment

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Architects and structural engineers are nowadays facing the great challenge of the twenty-first century, i.e. rethink the traditional process of building structures and infrastructures in order to provide novel environmentally sustainable materials and technologies for next-generation green constructions. Numerous natural and re-usable materials have already been identified and suggested as viable options for the construction industry. Their use is, however, often limited in practical applications because of the high initial cost. Nevertheless, reliable cost estimates should account for the entire life cycle cost of the construction. This also applies to cutting-edge technologies, e.g. base isolation and supplemental damping, employed in the passive protection of existing and new structures and infrastructures.

Base isolation along with energy dissipation devices are routinely being applied worldwide due to their maturity, reliability and cost-effectiveness. They are sound strategies to mitigate the earthquake-induced structural and non-structural damage. The use of such strategies is compliant with the requisites and performance of environmental sustainable constructions. Under moderate-to-high magnitude earthquakes, traditional fixed-based structures may experience severe and widespread damage. The seismic retrofitting of heavily damaged structures may be frequently not feasible or sustainable by the stakeholders. There are numerous examples of buildings and lifelines worldwide that collapsed when subjected to major earthquakes. The reconstruction of collapsed structures and infrastructures may also become unacceptable in a future sustainable environment. Minimizing the damage, or even preventing it, leads to reduced socio-economic losses. Additionally, the recovery in the aftermath of major seismic events does not impose the use (in the past, it was often misuse!) of large quantities and different types of construction materials.

The above discussion emphasizes the importance of utilizing advanced construction technologies, e.g. base isolation systems, in earthquake-prone countries to protect structures and infrastructures. Recently, there has been a great deal of active research to investigate new materials, e.g. recycled rubber, natural compounds and stainless steels, for future applications in eco-friendly isolators. Architects and structural engineers should become aware of the potentiality of base isolation systems and promote this technology in their projects, especially those including critical facilities, such as hospital and school buildings. The conceptual design of base isolation systems is simple, intuitive and environmentally sustainable.

BIO

Dr Luigi Di Sarno is Assistant Professor in Earthquake Engineering at the Engineering Department, University of Sannio at Benevento, Italy. Luigi obtained his PhD in Structural Engineering from University of Salerno, in Italy, jointly with Imperial College, London, UK. He also holds a MSc in Earthquake Engineering and Structural Design and a MSc in Structural Steel Design both from Imperial College, London, UK.

Luigi has been Visiting Professor at the Mid-America Earthquake Center, headquartered at University of Illinois, Urbana-Champaign, USA, since 2003. More recently, he became Honorary Member Staff at the College of Engineering, University of Bristol, UK. Other

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He is currently working on large projects for the State Emergency Management Agency (DPC), Italian Ministry of Education and Research and European Community. He is acting as team-member of the RELUIS Consortium, which is a headquartered in the Department of Structural Engineering, University of Naples, Federico II. He is Co-PI of several EU-funded research projects dealing with the seismic assessment and retrofitting of existing monumental and RC buildings, pseudo-dynamic and shaking table experimental tests on existing bridges, advanced hybrid tests for seismic soil-structure interaction.

He is part of a well - funded research group based in the University of Sannio, Benevento, and University of Naples Federico II, with a large portfolio of projects from private industry, state agencies, federal agencies, and international government and private entities. Luigi teaches many different subjects both at Naples and Benevento in Italy. He also had teaching duties in postgraduate courses while staying at UIUC, in Illinois.

Luigi acts as a technical reviewer of several international journals dealing with structural analysis and design, seismic assessment and vulnerability.
Luigi's technical interests are seismic analysis and design of buildings and bridges, innovative health care facilities, response of tall buildings to extreme loads, on which he has more than 90 research publications, including 20 refereed journal papers, many conference, research reports, book chapters and field investigation reports.