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Announcement

Structures and Buildings

Award-winning papers in 2022

Papers published in *Structures and Buildings* are eligible for awards from the Institution of Civil Engineers. Papers from any of the ICE journals can be nominated for several awards. In addition, each journal has awards dedicated to their specific subject area.

On Friday 14 October 2023, ICE president Keith Howells presented awards to the following papers published in *Structures and Buildings* in 2022. The editorial panel nominated their best papers and an awards committee chaired by Tim Broyd allocated the awards.

Frederick Palmer Prize

The Frederick Palmer Prize, presented for the best paper on structural design, was awarded to Grigorian and Kamizi (2022).

Abstract

The need for resilient or sustainable seismic design is at the forefront of structural engineering challenges worldwide. Sustainable seismic design is a relatively new concept that is rapidly gaining interest and hints at the arrival of the next generation earthquake engineering practice. In the present context 'sustainable seismic' refers to structural operability with a view to post-earthquake realignment and repairs. Experience has shown that it is cost inhibitive to elevate the status of conventional earthquake-resistant structures to seismic sustainability by means of traditional methods of design and construction. This paper introduces two simple analytic concepts, performance control and design led analysis, that lead to the development of sustainable seismic designs for purpose-specific archetypes. Seismic energy control, global stiffness reduction and restoring force adjustment are introduced as relatively simple methodologies that help achieve efficient post-earthquake realignment and repairs. Combinations of structures of uniform response and rigid rocking cores are used as ideal models for sustainable seismic design. Three simple technologies, the replaceable energy dissipating moment connection, the energy-dissipating grade beams and the hybrid rocking–stepping core, are also introduced. Several parametric examples are provided to demonstrate the applications of the proposed methodologies.

Bill Curtin Medal

The Bill Curtin Medal, presented for the best paper describing innovative design in civil engineering, was awarded to Zhan *et al*. (2022).

Abstract

To better control engineering structures subjected to external disturbances, such as earthquakes of varying magnitudes, a smart compound damper is developed and its performance is investigated in this paper. Unlike devices for passive control systems without adjustable control force, the dynamic responses of the engineering structure can be more effectively suppressed under seismic excitation by using devices for active control systems that feature active input to the actuators. A compound damper designed in this vein consists of shape memory alloy (SMA) wires and a variable-friction damper that can provide an adjustable control force according to the level of ground motion by changing the voltage of piezoelectric ceramic (PZC) actuators. Numerical simulations of a seismically excited two-storey steel frame structure were implemented to evaluate the performance of the proposed SMA/PZC compound damper. A back-propagation neural network model was developed using experimentally obtained data to describe the hysteretic behaviour of the SMA wires. A Takagi–Sugeno (T-S) fuzzy controller was used to determine the command voltage of the PZC actuators, such that the compound damper could perform well when applied to structural control. The resulting solution, hybrid control modulated with a T-S fuzzy control strategy, was found to be more effective than passive control.

REFERENCES

Grigorian M and Kamizi M (2022) High-performance resilient earthquake-resisting moment frames. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **175(5)**: 401–417, https://doi.org/10.1680/jstbu.19.00109.

Zhan M, Zhang L, Chen X and Wang S (2022) Dynamic response control of engineering structure equipped with smart compound damper. *Proceedings of the Institution of Civil Engineers – Structures and Buildings* **175(2)**: 129–140, https://doi.org/10.1680/jstbu.18.00234.