BUILDINGS, CONSTRUCTION & ARCHITECTURE

Seismic restraint device for suspended elements

BUILDING DESIGN | MONITORING SYSTEMS - EARTHQUAKES

PRIORITY NUMBER
102023000009123

PRIORITY DATE
05/08/2023

PATENT STATUS
Granted

LICENSE
Italy

TRL
3

LOOKING FOR

INDUSTRIAL PARTNER

LICENSE

RESEARCH TEAM | INVENTORS
Bryan Chalarca, Daniele Perrone, André Filiatrault, Roberto Nascimbene

Recent seismic events have shown that structures, if properly designed, are able to respond adequately to calamitous events and in particular to earthquakes. However, they still suffer significant damage to suspended non-structural elements such as piping and lighting systems. Such damage increases the repair costs of buildings and poses significant safety risks by blocking evacuation routes and interfering with critical functions such as fire protection systems. Considering that 80% of the construction costs of a strategic structure are made up of non-structural elements, their importance in the operational context of buildings is evident. The innovative device developed to address this issue has recently received an international award for Design and Innovation from the Anti-Seismic Systems International Society, confirming its value and impact.

Technical features

Building codes require that suspended non-structural elements be capable of withstanding specified seismic intensity levels to protect occupants and key building systems. Currently, most available systems rely on increasing lateral stiffness through bracing elements, which require complete replacement after significant seismic events, resulting in substantial economic losses and downtime. Our device eliminates the need for bracing elements to control lateral displacement, reducing installation area and minimizing permanent deformations by concentrating inelastic response on the friction damper. Compared to traditional systems, our technology uses additional damping to control maximum deformations without generating large local dynamic responses and applies a re-centering force that eliminates residual deformations. Thus, our device offers an innovative and effective solution that can be applied in different contexts in the field of earthquake engineering.

Possible applications

- Civil and industrial building sector;
- Seismic design of suspended nonstructural elements (e.g., piping, walkways, lighting systems, and air ducts);
- Application in a wide range of commercial and residential buildings, including critical infrastructure (e.g., hospitals, healthcare buildings, schools, universities, airports, and power plant).

PATENT OWNERS
IUSS Scuola Universitaria Superiore Pavia

knowledge share
UIBM Netval
Finanziato dall'Unione europea

Advantages

- Increased earthquake performance: permanent and residual deformations on supporting elements are minimized or reduced to zero;
- Improved safety: significant reduction in risks to human life and damage to strategic infrastructure;
- Cost-effectiveness: reduction in repair time and cost;
- Design flexibility and adaptation to specific project needs.