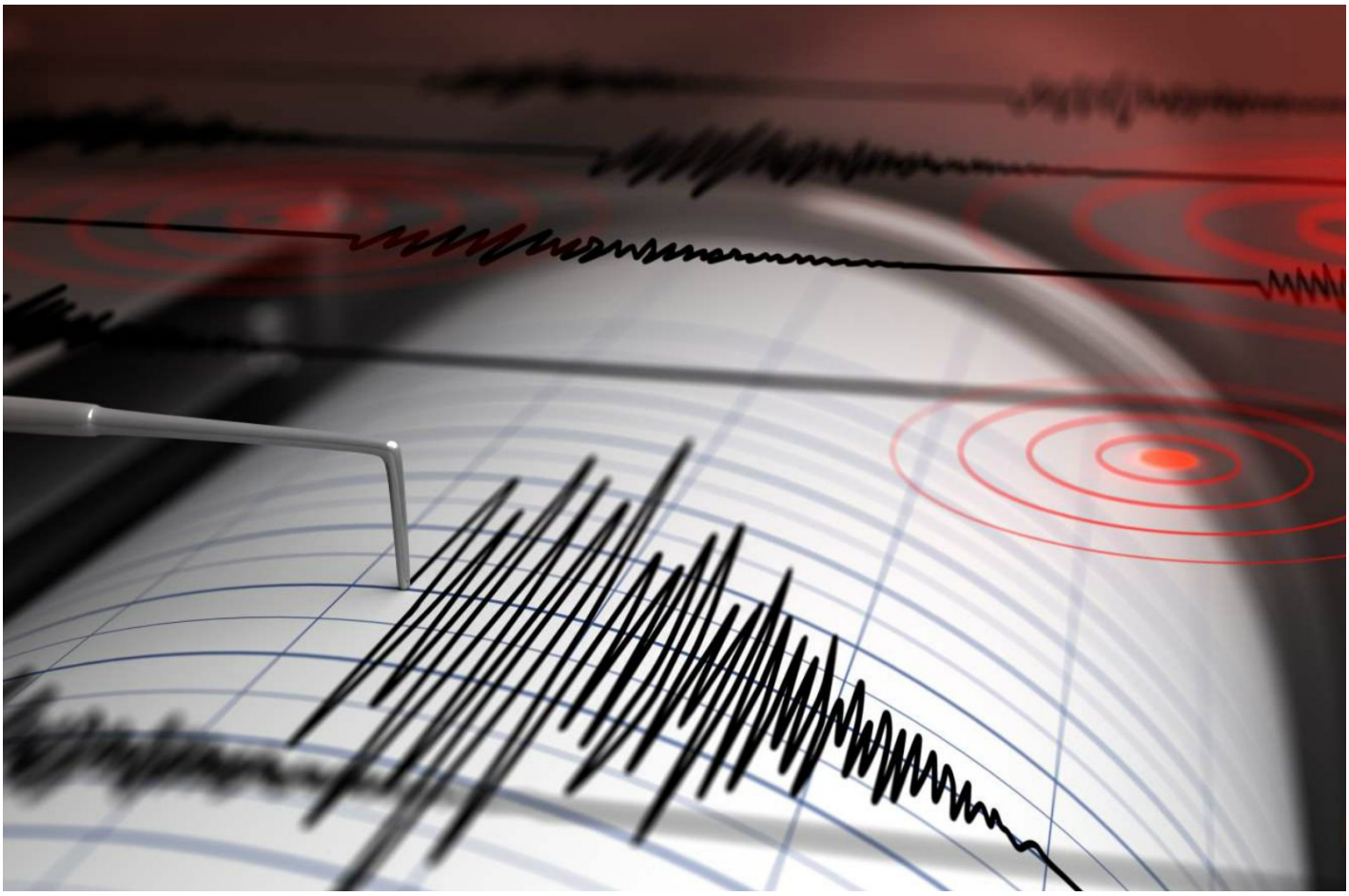
Brace Buffers Buildings To Protect People And Profits

Ecole Polytechnique de Montreal



It's less than two to three inches, but it's an amount big enough to allow buildings and their occupants to avoid a close call. That's the amount of sway allowed by a new self-recentering brace that is designed to let buildings give a little during stress—such as an earthquake—and then right itself to within a few millimeters of its starting position.

Keeping Profits and People Safe

The technology, which is the brainchild of civil engineering professors Robert Tremblay, école Polytechnique de Montréal, and Constantin Christopoulos, University of Toronto, is designed to play a critical role in maintaining a building's structural integrity, not only keeping its occupants safer, but allowing the businesses it houses to remain up and running after a natural disaster. Something that is especially critical for first-responders such as firehouses, hospitals and police departments. "The technology provides affordable ways of achieving superior performance for structures, including buildings, subjected to extreme loading conditions," explains Didier Leconte, manager, business development, sciences and engineering at Univalor in Montréal, Quebec, Canada. "For example, those induced by

earthquakes, wind storms or explosions, thus saving lives and protecting infrastructures."

Bracings are regularly used to support buildings and help them absorb energy. They are structural elements set diagonally between the floor levels to make structures resist lateral loads and shocks.

Current bracings are made from steel; however, this material, when loaded beyond its limit, yields and deforms permanently. The new device, which can be used for new construction or worked into an existing building, is also made from steel but is designed to work a bit like an elastic band to absorb and
dissipate some of the energy, says Leconte.

"The tendons in the bracing exert a steady restoring force, a bit like a spring, when a building deforms and puts pressure on it," he explains. "At the end of the earthquake, the spring realigns the building and brings it back to its initial position."

Close Calls on the Way to Market

Interestingly enough, the technology itself had several close calls on its way to market. In fact, its very origin was a simple matter of coincidence.

The researchers, who knew each other during graduate school but had since went separate ways, decided to reconnect over coffee one afternoon. From their café conversation sprung the idea for the new spring.

Aware of the potential of this invention, the researchers filed invention disclosures with their respective universities as soon as the concept was defined. The universities then alerted their commercialization entity—Univalor, which serves several Canadian institutions.

After meeting with the researchers, Univalor staff decided to take over the project and moved swiftly to secure the patents and move the commercialization aspects of the technology forward. Simultaneously, the professors continued testing their invention.

"The researchers actually built a full-scale prototype that was about 29 feet wide and 12 feet high and used bracing that was about the normal scale," explains Leconte. "Then they submitted the model to tremors equivalent to those of a major earthquake."

Meanwhile, the technology was so promising that Univalor continued to work on an international patent, knowing that its market would most likely be the Pacific Rim.

But financing further research was proving tricky. "There came a moment when we had to invest some big money to keep the patent protection going," says Leconte. "It looked like the project was going to die. But the researchers believed so strongly in the technology that they asked to share the costs of prosecution and eventually contributed about $50,000 [Canadian] of their own money."

Set to Shake up the Market

Eventually however, their gamble paid off and Univalor was able to strike a deal with a South Korean company, Dongil Rubber Belt Co. Ltd. (DRB), which agreed to collaboratively develop the technology. The company, which has worldwide distribution channels, also agreed to help finance further testing of the device. The company hopes to start sales this year and to have the first device installed early in 2009 or 2010 at the latest.

But even this industrial partnership happened almost by chance. One of Christopoulos' doctoral students, Hyung-Joon Kim, Ph.D., who worked on the experimental validation of the system while he was a student, mentioned DRB as a potential partner and made first contact. Subsequently, Univalor cultivated a close relationship with DRB, one that was significantly reinforced by a trip to Montréal by three DRB executives and engineers. They visited the laboratories at école Polytechnique and liked what they saw. From there, they explored possible commercialization partnership strategies with Univalor.

"It took us a little while to find the right company to license the technology," says Leconte. "Because the device had not been tested in real-life conditions and it looked like it might take some years to go to market. That made some companies a little skeptical. But based in part on the credibility and reputation of the researchers and the direct link to the company that Dr. Kim provided us with, we were able to eventually find a really good fit."

It remains to be seen, however, if the new bracing will shake up the market, because it is more expensive than the traditional methods. But Leconte thinks that even with a price premium, the market is ripe for a device such as this. Not only are building regulations getting stiffer, but manufacturers and other
businesses in high-risk areas realize that investing upfront in the structure could mean avoiding costly downtime later.

"Countries exposed to earthquakes and other natural disasters are constantly seeking out ways to shelter their buildings from catastrophe," says Leconte. "Through this deal, countries will have access to high-performance protection technology."

But in addition to helping shepherd a life- and property-saving product to market, for Leconte, there is further satisfaction in knowing that he and the researchers didn't give up.

"The takeaway message in this story," says Leconte, "is to think twice before withdrawing from a potential patent....one day, you just might have a deal."

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