



## System to withstand earthquakes

An innovative new seismic system is being installed in the new community centre under construction in Carterton.

It is only the second time worldwide that the system, invented in 2005 by University of Canterbury researchers, has been used. The \$6 million Carterton Events Centre, the first civic building to be built in the town for more than 100 years, includes a 300-seat main auditorium using the new "Pres Lam" structural system.

The timber system uses laminated veneer lumber (LVL) to form large walls which are post-tensioned to the ground using embedded high-strength steel rods, which have been tested to withstand earthquake loads.

Project architect, Opus Architecture, is in charge of the project. Opus Senior Structural Engineer Dave Dekker said the system allowed walls to rock back and forth in an earthquake, absorbing earthquake energy as they move.

"It significantly reduces the amount of movement and damage to a building during an earthquake, meaning fewer repairs for the building after a large quake, not to mention overall safety."

"The design of the rods inside the walls causes the building to return to a vertical position, rather than to the angle the building happens to be at once the shaking stops."

The LVL system was developed as an alternative to effectively the same system constructed in concrete.

"We wanted to see how we could apply this technology to the Carterton project using LVL manufactured by JNL at its mill, just along the road from the new centre, made from locally grown trees," said Mr Dekker. "We discussed the idea with JNL and explored other ways we could use their LVL and plywood because of the local connection and high quality of the products."

The Pres Lam system can be used either in framing for multi-story buildings or in a series of walls spaced around the building. Mr Dekker said walls were more suited to the large open spaces such as in the single-storey Carterton auditorium where spans across the building were too large for framing. "The framing system can be used in office and residential buildings which do not require large and open interior spaces."

The system was invented in 2005 by Alessandro Palermo, Stefano Pampanin and Andy Buchanan. Its use in the Carterton centre is being peer reviewed by Dr Alessandro Palermo, University of Canterbury Senior Lecturer in Structural Engineering.

"The peer review, funded by the Foundation for Research Science and Technology, was important as this is relatively new technology and we wanted the council to be assured the design was correct and in accordance with the building code and standard," said Mr Dekker.

JNL Masterton, Assistant Mill Manager, Paul Jordan, said the company had worked closely with Opus to supply all the LVL and plywood for the project. "Using local products, knowledge and skills to apply this new use for LVL in the community centre has been a great opportunity. We look forward to seeing more buildings like this in New Zealand and around the world."

The LVL system has multiple benefits over structural steel and concrete. It not only holds up and springs back into place in an earthquake, but is produced using a renewable resource with a negative carbon footprint. Also made from LVL, the Carterton auditorium roof trusses span up to 20 metres over the stage area.

Dr Palermo said the system had much greater potential now than it did a year ago, following the Christchurch earthquakes. "The system works wonderfully well for low-rise multi-storey buildings [three to 10 storeys] which covers the range of Christchurch buildings."

"It is easy to transport and quick to build. The components can be fabricated off site allowing for cheaper, faster and safer construction on site. Its damage-free seismic structural system and low weight makes the system very safe and allows immediate occupancy after an earthquake."

The Carterton District Council Chief Executive, Colin Wright, said the earthquake proofing was especially re-assuring and would assist in enabling the multi-purpose centre to act as an emergency welfare centre for the town.

The first application of the Pres Lam system in the world was in the just-completed Nelson-Marlborough Institute of Technology's Arts and Media building.



**Easy does it:** Contractors guide one of the eleven walls onto post tensioned rods which are designed to rock back and forth in an earthquake and return to a vertical position once it stops.

The lower rods are joined inside the wall to another set of rods which are joined to the roof.

**Inset – Going up:** Part of the new Carterton Events Centre auditorium building currently under construction, showing four of the eleven walls designed to protect the building from earthquakes.

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