



Media information

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New seismic system for Carterton community centre

An innovative new seismic system is being installed in a 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 shear 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 Pres Lam 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 post-tensioned rods 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 post-tensioned LVL system was developed as an alternative to effectively the same system constructed in concrete. The timber connection technique was also adapted from post-tensioned pre-cast concrete systems.

"We wanted to see how we could apply this technology to this project using LVL manufactured by Juken New Zealand Ltd (JNL) at its mill, just along the road from the new community 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 shear walls. Mr Dekker said shear 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, open interior spaces.”

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

Phase one, now complete, reviewed the Opus design which included refining and improving the design of the connection detailing. Computer analysis to confirm the expected behavior of the auditorium in ground shaking similar to what could happen in the Carterton area, is now being conducted by Dr Palermo.

“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. Mr Jordan said the ‘cradle to grave’ carbon footprint for New Zealand-produced untreated LVL, transported, used and disposed of within NZ in a current average landfill, was negative, resulting in net storage of 266 kg CO₂-e.

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 (3 to 10 stories) 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.”

Mr Dekker said large pieces of timber stood up well to fire as the outside chars and acts as insulation for the rest of the wooden structure. The LVL shear walls are also encased within the plaster-board lining which would help prevent destruction in a fire.

Also made from LVL, the Carterton auditorium roof trusses span up to 20m over the stage. The use of nailed steel plates provides economic and less visually-intrusive truss connections that do not detract from the clean lines and natural appearance of the timber elements.

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

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. (Ends)

A series of hi-resolution, high-quality photographs are available on request.

Project details

Location: *Carterton, New Zealand*
Project manager: *Opus Architecture*
Structural Engineer: *Opus International Consultants*
Construction Co: *Holmes Construction Group*
LVL manufacturer: *Juken NZ (JNL)*

Timber technical information - Carterton Events Centre

- 11 shear walls are installed in the auditorium.
- Each LVL wall (6.7m high x 2.4m) contains approximately 22 sheets of LVL (3m x 1.2m x45mm) which equates to a total 231 sheets
- Shear walls are made of four layers of 45mm LVL sheets, glue-laminated together to form a 180mm thick wall.
- Auditorium trusses contain approximately 3.5km of specially cut LVL
- Bracing and wall linings - approximately 1,000 sheets of plywood (overall centre)
- Roof and wall structure framing - approximately 3km of JNL J-frame (overall centre)

Further information from:

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