NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

You are cordially invited to the seminar organised by Protective Technology Research Centre (PTRC).

Seminar on

Earthquake Damage Resistant Post-Tensioned Multi-Storey Timber Buildings: From Theory to Practice

Abstract:

The recent growth of cross-laminated timber (CLT) panel systems in Europe has launched timber as a sustainable and cost-effective alternative to concrete and steel buildings. However, CLT panel systems require a large number of internal structural walls which limits the flexibility of architectural design. CLT and other engineered timber materials such as Laminated Veneer Lumber, high-grade glue-Lam make the use of post-tensioning techniques a feasible option for timber buildings.

Post-tensioned timber beams and frames give opportunities for much greater use of engineered wood products in large buildings by creating large open spaces, excellent living and working environments, and resistance to hazards including earthquakes and extreme events. The post-tensioning provides for rapid erection, simple and economical connections between the large timber elements.

Post-tensioned timber building systems are being developed at the University of Canterbury in collaboration with the Structural Timber Innovation Company Ltd (STIC) funded by Australian and New Zealand industries, and the New Zealand government. The post-tensioned structural system uses unbonded steel tendons in ducts in large timber box beams and/or flooring panels. Beams and suspended floors can be designed similarly to concrete structures for sustaining vertical loading. The technology, if additional supplemental damping is provided, can also be used for earthquake resistant systems, such as moment resisting frames and walls. In moment-resisting timber frames, the steel tendons pass through the columns, providing the moment resistance, while in walls, vertical post-tensioning with vertical ducts for the tendons passes through the concrete foundation.

Post-tensioning only provides excellent post-earthquake re-centering capability of the buildings but not dissipation, therefore additional external/internal steel bars, respectively placed at the beam-to-column and wall-to-foundation interface for frames and walls, serves as dissipative fuses. The presentation overviews the benefits of post-tensioning for low-rise multi-storey timber buildings and illustrates the technical details adopted for the several timber buildings designed in New Zealand.

Speaker:

Prof Alessandro PALERMO is Professor of Structural Engineering at the Department of Civil and Natural Resources Engineering at the University of Canterbury, Christchurch, New Zealand. He is author of more than 260 publications including 3 international patents in the field of earthquake bridge and structural engineering. His core expertise deals with the implementation of innovative technologies that minimise post-earthquake damage in built infrastructure. During the last 6 years, he has been involved as external consultant, peer reviewer and numerical modelling analyst in innovative projects in New Zealand such as, the Wigram-Magdala bridge link in Christchurch (the world's first hybrid PRESSS bridge), Nelson Marlborough Institute of Technology Arts and Media building (the world's first commercial post-tensioned timber structure), followed by many projects related to post-tensioning techniques for timber buildings: Carterton Event Centre (Carterton), STIC building (Christchurch), Kaikoura Civic Centre (Kaikoura) and K-MART building (Richmond, Nelson). He is also the Co-founder and Director of a University spin-off company, PTL Timber Consultants.

Date: 17 Jan 2018 (Wednesday)
Time: 4.00pm to 5.00pm
Venue: CEE Seminar Room A, Block N1, Level B1, N1-B1b-06
School of Civil and Environmental Engineering (CEE), Nanyang Technological University | Singapore