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Lateral load resisting systems for engineered wood construction

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Abstract: The main sources of lateral loads on buildings are either strong winds or earthquakes. These lateral forces are resisted by the buildings' Lateral Load Resisting Systems (LLRSs). Adequate design of these systems is of paramount importance for the structural behaviour in general. Basic procedures for design of buildings subjected to lateral loads are provided in national and international model building codes. Additional lateral load design provisions can be found in national and international material design standards. The seismic and wind design provisions for engineered wood structures in Canada need to be enhanced to be compatible with those available for other materials such as steel and concrete. Such design provisions are of vital importance for ensuring a competitive position of timber structures relative to reinforced concrete and steel structures.

In this project a new design Section on Lateral Load Resisting Systems was drafted and prepared for future implementation in CSA O86, the Canadian Standard for Engineering Design in Wood. The new Section was prepared based on gathering existing research information on the behaviour of various structural systems used in engineered wood construction around the world as well as developing in-house research information by conducting experimental tests and analytical studies on structural systems subjected to lateral loads. This section for the first time

structural systems subjected to lateral loads. This section for the first time tried to link the system behaviour to that of the connections in the system. Although the developed Section could not have been implemented in CSA O86 in its entirety during the latest code cycle that ended in 2008, the information it contains will form the foundation for future development of technical polls for implementation in the upcoming editions of CSA O86.

Some parts of the developed Section were implemented in the 2009 edition of CSA O86 as five separate technical polls. The most important technical poll was the one on Special Seismic Design Considerations for Shearwalls and Diaphragms. This technical poll for the first time in North America includes partial capacity design procedures for wood buildings, and represents a significant step forward towards implementing full capacity-based seismic design procedures for wood structures. Implementation of these design procedures also eliminated most of the confusion and hurdles related to the design of wood-based diaphragms according to 2005 National Building Code of Canada. In other polls, the limit for use of unblocked shearwalls in CSA O86 was raised to 4.8 m, and based on the test results conducted during the project, the NLGA SPS3 fingerjoined studs were allowed to be used as substitutes for regular dimension lumber studs in shearwall applications in engineered buildings in Canada.

With the US being the largest export market for the Canadian forest products industry, participation at code development committees in the field of structural and wood engineering in the US is of paramount importance. As a result of extensive activities during this project, for the first time one of the AF&PA Special Design Provisions for Wind and Seismic includes design values for unblocked shearwalls that were implemented based on FPInnovations' research results. In addition, the project leader was involved in various aspects related to the NEESWood project in the US, in part of which a full scale six-storey wood-frame building will be tested at the E-Defense shake table in Miki, Japan in July 2009. Apart from being built from lumber and glued-laminated timber provided from Canada, the building will also feature the innovative Midply wood wall system that was also invented in Canada. The tests are expected to provide further technical evidence for increasing the height limits for platform frame construction in North America.

Building construction - Design

Earthquakes, Effect on building construction

Glued joints - Finger

Grading - Lumber

Wind loads

Documents

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