

Advanced wood-based solutions for mid-rise and high-rise construction: modelling of timber connections under force and fire

<https://library.fpinnovations.ca/fr/permalink/fpipub49851>

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Collaborateur: Natural Resources Canada. Canadian Forest Service

Date: March 2018

Genre du document: Research report

Description physique: 85 p.

Secteur: Wood Products

Domaine: Sustainable Construction

Champ de recherche: Advanced Wood Materials

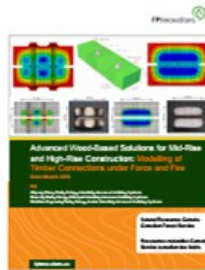
Sujet: Cross Laminated Timber
 Fire
 Performance
 Timber

Langue: English

Résumé:

FPInnovations carried out a survey with consultants and researchers on the use of analytical models and software packages related to the analysis and design of mass timber buildings. The responses confirmed that a lack of suitable models and related information for material properties of timber connections, in particular under combination of various types of loads and fire, was creating an impediment to the design and construction of this type of buildings. Furthermore, there is currently a lack of computer models for use in performance-based design for wood buildings, in particular, seismic and fire performance-based design. In this study, a sophisticated constitutive model for wood-based composite material under stress and temperature was developed. This constitutive model was programmed into a user-subroutine and can be added to most general-purpose finite element software. The developed model was used to model the structural performance of a laminated veneer lumber (LVL) beam and a glulam bolted connection under force and/or fire. Compared with the test results, it shows that the developed model was capable of simulating the mechanical behaviour of LVL beam and glulam connection under load and/or fire with fairly good correlation. With this model, it will allow structural designers to obtain the load-displacement curve of timber connections under force, fire or combination of the two. With this, key design parameters such as capacity, stiffness, displacement and ductility, which are required for seismic or fire design, can be obtained. It is recommended that further verification and calibration of the model be conducted on various types of wood products, such as CLT, glulam, SCL and NLT, and fasteners, e.g. screw and rivet. Moreover, a database of the thermal and structural properties of the wood members and fasteners that are commonly used in timber constructions need to be developed to support and facilitate the application of the model.

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Performance-based approach to support tall and large wood buildings: fire and seismic performance

<https://library.fpinnovations.ca/fr/permalink/fpipub49569>

Auteur: Dagenais, Christian
Chen, Zhiyong
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Collaborateur: Natural Resources Canada. Canadian Forest Service

Date: October 2017

Genre du document: Research report

Description physique: 48 p.

Secteur: Wood Products

Domaine: Sustainable Construction

Champ de recherche: Building Systems

Sujet: Cross Laminated Timber
Fire
Performance
Adhesives

Langue: English


Résumé: The objective of the current project is to develop a performance-based design process for wood-based design systems that would meet the objectives and functional statements set forth in the National Building Code of Canada.

More specifically, this report discusses the fire and seismic performance of buildings, as identified as a priority in a previous FPInnovations report.

Documents



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WoodST: an advanced modelling tool for fire safety analysis of timber structures

<https://library.fpinnovations.ca/fr/permalink/fpipub7943>

Auteur: Chen, Zhiyong
Dagenais, Christian
Ni, Chun

Date: January 2021

Genre du document: Research report

Description physique: 5 p.

Secteur: Wood Products

Domaine: Sustainable Construction

Champ de recherche: Advanced Wood Materials

Sujet: Fire
Models
Performance
Timber

Langue: English

Résumé: WoodST is capable of calculating heat transfer, charring rate, load-displacement curve as well as the time and mode of failure of timber structures exposed to fire, thus providing a cost-competitive solution for the fire safety analysis of timber structures. This InfoNote briefly introduces the development and verification of WoodST. Two applications of WoodST are also demonstrated.

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WoodST: outil de modélisation avancé pour l'analyse de la sécurité incendie des structures en bois

<https://library.fpinnovations.ca/fr/permalink/fpipub7944>

Auteur: Chen, Zhiyong
Dagenais, Christian
Ni, Chun

Date: Janvier 2021

Genre du document: Research report

Description physique: 5 p.

Secteur: Wood Products

Domaine: Sustainable Construction

Champ de recherche: Advanced Wood Materials

Sujet: Fire
Models
Performance
Timber

Langue: French

Résumé: WoodST est capable de calculer le transfert de chaleur, la vitesse de carbonisation, la courbe charge-déplacement ainsi que le moment et le mode de défaillance des structures en bois exposées au feu, offrant ainsi une solution à coût compétitif pour l'analyse de la sécurité incendie des ossatures en bois. La présente note d'information présente brièvement le développement et la vérification de WoodST. Deux applications de WoodST sont également présentées.

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