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Research Library

From Canada to the world: FPInnovations' three-generation floor vibration research and code implementation

https://library.fpinnovations.ca/en/permalink/fpipub7936

Author:	Hu, Lin J. Cuerrier-Auclair, Samuel Qian, Cheng Dale, Angela
Date:	January 2021
Material Type:	InfoNote
Physical Description:	3 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Building Systems
Subject:	Design Floor Mass timber Performance Standards Vibration
Series Number:	InfoNote; 2021 n.2
Language:	English
Abstract:	FPInnovations' three-generation floor vibration-controlled design methods in NBCC and CSA O86 ensure market acceptance by consumers. Since 1990, there have been very few consumer complaints. This reinforces the use of wood as a quality building material and contributes to expanding market shares of wood construction in Canada.

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Depuis le Canada vers le reste du monde: Mise en oeuvre de la recherche et développement de troisième génération de FPInnovations sur les vibrations des plancher

https://library.fpinnovations.ca/en/permalink/fpipub7940

Author:	Hu, Lin J.
	Cuerrier-Auclair, Samuel
	Qian, Cheng
	Dale, Angela
Date:	Janvier 2021
Material Type:	InfoNote
Physical Description:	4 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Building Systems
Subject:	Design
	Floor
	Mass timber
	Performance
	Standards
	Vibration
Series Number:	InfoNote; 2021 n.2
Language:	French
Abstract:	Comme l'ont démontré le développement et la mise en oeuvre des codes des méthodes de conception de troisième génération pour lutter contre les vibrations des planchers, FPInnovations joue un rôle important au Canada et à l'échelle internationale dans les comités de codes et de normes visant à protéger les consommateurs et l'industrie du bois et contribue à la croissance continue du marché de la construction en bois à l'échelle mondiale.

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Stand conversion for wildfire risk mitigation management strategies

https://library.fpinnovations.ca/en/permalink/fpipub7942

Author:	Matute, Pamela
Contributor:	Alberta Agriculture and Forestry
Date:	February 2021
Material Type:	Research report
Physical Description:	21 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Wildfire Operations
Subject:	Wildfires
	Infrared sensing
	Hotspots
	Aircraft
	Forestry
	FPI TR
	FOP Technical Report
Series Number:	Technical Report ; TR 2021 No.7
Language:	English
Abstract:	This review explores the benefits, challenges, limitations, logistics, and cost-effectiveness of different management options to convert conifer-dominated stands to aspen-dominated stands. These alternatives can include overstory removal (harvesting, bulldozing, shear blading, prescribed burning) and site preparation (root trenching, drag scarification, broadcast burning) treatments. On sites where parent aspen trees are not present in the original stand, tree planting will be necessary albeit costly in comparison to regeneration by suckering. While extensive literature exists on the regeneration of trembling aspen through suckering, research on artificial establishment with seedlings and its requirements is still in its infancy and rapidly developing.

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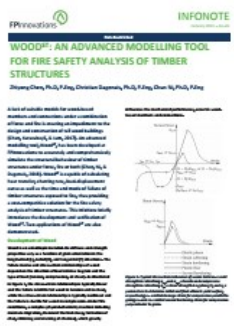

WoodST: an advanced modelling tool for fire safety analysis of timber structures

https://library.fpinnovations.ca/en/permalink/fpipub7943

Author:	Chen, Zhiyong
	Dagenais, Christian
	Ni, Chun
Date:	January 2021
Material Type:	Research report
Physical Description:	5 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Fire
	Models
	Performance
	Timber
Language:	English
Abstract:	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/en/permalink/fpipub7944

Author:	Chen, Zhiyong
	Dagenais, Christian
	Ni, Chun
Date:	Janvier 2021
Material Type:	Research report
Physical Description:	5 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Fire
	Models
	Performance
	Timber
Language:	French
Abstract:	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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Truck platooning: principle of operation and benefits webinar

https://library.fpinnovations.ca/en/permalink/fpipub7946

Author:	Bevly, David M.

Date:	February 2021
Material Type:	Webinar
Physical Description:	Video ; 48:26 min.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Transportation Infrastructure
Subject:	Transportation
	Trucks
	Platooning
	Webinar
Series Number:	Video ; 2021
Language:	English
Abstract:	Hosted by Edouard Proust, this presentation by David Bevly held on February 10, 2021 highlights an important component of FPInnovations' Transportation and Infrastructure group's work. The concept of truck platooning, inspired by pelotons of cyclists and originally developed for highway use to obtain fuel savings, utilizes technology to maintain the desired distance between trucks by controlling acceleration and braking, and the relative lateral position of the vehicles by steering, reacting faster than a driver can. Truck platooning has attracted the attention of the natural resources sector and its implementation is expected to increase the productivity of drivers. By allowing the operation of driverless following trucks replicating the path set by the human operated leader vehicle, the concept could help mitigate the workforce shortage that impact the sector while supporting the supply of lumber to mills across the country.
Abstract:	Ce contenu est exclusivement en anglais. Merci de contacter notre équipe si vous souhaitez obtenir de l'information en français. Cette présentation de David Bevly a été organisée le 10 février 2021 par Edouard Proust. Elle met en lumière une composante importante du travail effectué par le groupe Transports et Infrastructures de FPInnovations. Le concept d'opération de camions en peloton est inspiré des pelotons de cyclistes et a été mis au point à l'origine pour des applications autoroutières avec pour objectif une réduction de la consommation de carburant. Les camions sont équipés d'une technologie permettant le contrôle de l'accélération, du freinage et de la direction offrant la possibilité de maintenir la distance de suivi entre les véhicules ainsi que leur positionnement latéral relatif. En autorisant la mise en œuvre de camions suiveurs entièrement autonomes et qui répliquent le tracé du camion de tête opéré par un chauffeur, le concept pourrait à terme aider à minimiser l'impact du manque de chauffeurs dans l'industrie tout en supportant l'approvisionnement en fibre des scieries à travers le Canada.

Video Tracks

Oriented pile flammability burn trial October 2020. Collaborations with Mosaic Forest Management and British Columbia Wildfire Service

https://library.fpinnovations.ca/en/permalink/fpipub7947

Author:	Spencer, Stuart
	Hvenegaard, Steven
	MacKinnon, Brandon
Contributor:	Mosaic Forest Management
	British Columbia Wildfire Service
Date:	February 2021
Material Type:	Research report
Physical Description:	31 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Wildfire Operations
Subject:	Wildfires
	Infrared sensing
	Hotspots
	Aircraft
	Forestry
	FPI TR
	FOP Technical Report
Series Number:	Technical Report ; TR 2021 N 8
Location:	British Columbia
Language:	English
Abstract:	The clean air initiative led by the British Columbia Ministry of Environment seeks to develop innovative methods to improve community air quality by utilizing harvest residues and minimizing the volume of fibre burned at roadside. Retaining processed tops as roadside oriented piles is proposed as an alternative to burning debris. These burn trials have demonstrated that in this unique arrangement of fuels and interaction of site-specific variables, particular areas of the piles will be more vulnerable to ignition sources which can lead to sustained burning and high intensity fire behaviour. In addition to the low fuel moisture conditions, other fuel properties, such as the close proximity of piles, high volume of fine fuels (branches and needles) and orientation of piles to road all contributed to enhanced burning at this site.

Documents

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Advanced industrialized construction to achieve high building energy efficiency

https://library.fpinnovations.ca/en/permalink/fpipub7950

Author:	Wang, Jieying
Date:	February 2021
Material Type:	Research report
Physical Description:	6 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Building construction
	Energy
	Thermal properties
Series Number:	InfoNote 2021 N. 5
Location:	Vancouver, British Columbia
Language:	English
Abstract:	Building high energy efficiency has become a must to reduce carbon emission from the built environment and to meet needs of consumers. Industrialized construction provides an effective way to produce highly insulated and airtight building envelopes to achieve superior building performance, such as Net Zero Energy. However, it is important that as other attributes (e.g., seismic, wind, fire, vibration, etc.) are being addressed, further research is needed to develop well rounded building envelope solutions. Meanwhile, improvement may be made in automated production equipment and software to optimize and monetize these solutions.

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Développer la construction industrialisée pour améliorer l'efficacité énergétique des bâtiments

https://library.fpinnovations.ca/en/permalink/fpipub7951

Author:	Wang, Jieying
Date:	Février 2021
Material Type:	Research report
Physical Description:	6 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Building construction
	Energy
	Thermal properties
Series Number:	InfoNote 2021 N. 5
Location:	Vancouver, British Columbia
Language:	French
Abstract:	Il est devenu indispensable de construire des bâtiments à haute efficacité énergétique pour réduire les émissions de carbone dans l'environnement et répondre aux besoins des consommateurs. La construction industrialisée est un bon moyen de produire des enveloppes de bâtiment bien isolées et étanches à l'air et, par le fait même, d'accroître la performance énergétique des bâtiments (p. ex consommation énergétique nette zéro). Cependant, il est important de tenir compte d'autres attributs (p. ex. charges sismiques, vent, feu, vibrations, etc.). Il faudra poursuivre les recherches pour trouver des solutions durables en matière d'enveloppes de bâtiment. Entre-temps, il est possible d'améliorer l'équipement de production automatisée et le logiciel qui l'accompagne afin d'optimiser et de rentabiliser ces solutions.

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Testing R22+ wood-frame walls for hygrothermal performance in the Vancouver climate: field wall performance

https://library.fpinnovations.ca/en/permalink/fpipub7958

Author:	Wang, Jieying
Date:	February 2021
Material Type:	Research report
Physical Description:	100 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Building Systems
Subject:	Wood frame
	Performance
	British Columbia
	Climate
	Environment
Language:	English
Abstract:	This new study aims to generate hygrothermal, particularly moisture-related performance data for light wood-frame walls meeting the R22 effective (RSI 3.85) requirement for buildings up to six storeys in the City of Vancouver. The overarching goal is to identify and develop durable exterior wood-frame walls to assist in the design and construction of energy efficient buildings across the country. Twelve test wall panels in six types of wall assemblies are assessed in this study. The wall panels, each measuring 4 ft. (1200 mm) wide and 8 ft. (2400 mm) tall, form portions of the exterior walls of a test hut located in the rear yard of FPInnovations' Vancouver laboratory. This report, second in a series on this study, documents the performance of these wall assemblies based on the data collected over 19 months' period from October 2018 to May 2020, covering two winter seasons and one summer.

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Performance assessment of wildfire suppressant products using the crib test methodology

https://library.fpinnovations.ca/en/permalink/fpipub7857

Author:	Refai, Razim
	Paskaluk, Stephen
Date:	January 2021
Material Type:	Research report
Physical Description:	27 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Wildfire Operations
Subject:	Fire retardant
	Fuel treatment
	Retardant
	Test methods
	FPI TR
	Water
Series Number:	Technical Report ; TR 2021 n.2
Location:	Alberta
Language:	English
Abstract:	FPInnovations' Wildfire Operations Advisory group has asked its researchers to explore a method by which the performance of water-enhancing products can be repeatedly assessed in the laboratory. A new test method, known as the crib test, was designed to evaluate the effectiveness of water-enhancing products on burning woody fuel to simulate direct-attack aerial operations. This report outlines the methodology for the crib test and describes the findings from performance evaluation tests conducted at the Protective Clothing and Equipment Research Facility (PCERF) at the University of Alberta.

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Wildfire suppressant rheology. Mapping viscosity as a function of product mix ratios

https://library.fpinnovations.ca/en/permalink/fpipub7858

Author:	Refai, Razim
	Yang, Junyi
	Tsai, Peichun Amy
Contributor:	University of Alberta
Date:	January 2021
Material Type:	Research report
Physical Description:	20 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Wildfire Operations
Subject:	Fire retardant
	Retardant
	Viscosity
	Water
	FPI TR
Series Number:	Technical Report ; TR 2021 n.3
Location:	Alberta
Language:	English
Abstract:	The USDA Forest Service's Qualified Product List (QPL) provides guidance on the range of permissible mix ratios for water-enhancer products. Due to the proprietary nature of water-enhancer products, there are several unknowns about the rheology of the permissible mix ratios. This study focused on mapping the viscosity of various suppressant products as a function of their mix ratios. The results revealed a wide range of viscosities across products, with each product showing a different non-linear relationship with different mix ratios. The results from this study can help understand the optimum viscosity range to achieve desired drop characteristics during aerial operations.

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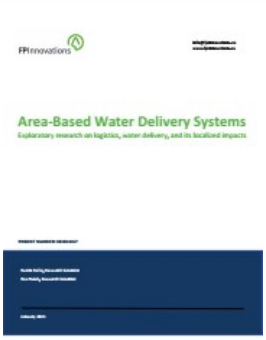

Area-based water delivery systems. Exploratory research on logistics, water delivery, and its localized impacts

https://library.fpinnovations.ca/en/permalink/fpipub7859

Author:	Refai, Razim
	Hsieh, Rex
Date:	January 2021
Material Type:	Research report
Physical Description:	20 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Wildfire Operations
Subject:	Fire retardant
	Retardant
	Spruce
	Water
	FPI TR
Series Number:	Technical Report ; TR 2021 n.1
Location:	Alberta
Language:	English
Abstract:	The aim of this study was to capture data on area-based water delivery systems, specifically in the context of logistics, systems differentiation, water delivery, and its localized effects. FPInnovations successfully collaborated with Fire & Flood to obtain this data. A two-day test was executed during which Fire & Flood set up their 4- and 12-inch systems and carried out sprinkler operations.

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Vivre avec le bois, dynamique des marchés: proposition

de valeur. Rapport 5

https://library.fpinnovations.ca/en/permalink/fpipub7707

Author:	Kinuani, Nsimba
	Chamberland, Vincent
	Gagnon, Marie-Elaine
Contributor:	Natural Resources Canada (NRCan)
	Ontario Ministry of Natural Reources Forestryv(OMNRF)
Date:	Mars 2020
Edition:	52981
Material Type:	Research report
Physical Description:	24 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Market Analysis
Subject:	Construction materials
	Markets
	Wood products
	Value
Language:	French
Abstract:	La présente proposition de valeur résume les conclusions des différentes études menées au Canada et aux États-Unis, lesquelles identifient les menaces ou défis ainsi que les différentes occasions qui se présentent pour l'industrie du bois de la deuxième transformation, en particulier pour les quatre secteurs suivants : revêtements de plancher, patios et terrasses, parements extérieurs et armoires de cuisine. Le but ultime de cette proposition est de dresser les pistes de recherche afin de maintenir ou d'accroître les parts de marché des produits du bois existants ou de gagner des marchés avec des produits novateurs. Ce rapport évalue également les priorités d'actions en fonction des menaces ou défis auxquels l'industrie fait face.

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Development of CLT products with improved fire performance

https://library.fpinnovations.ca/en/permalink/fpipub7708

Author:	He, Guangbo
	Feng, Martin
	Roussière, Fabrice
Date:	March 2020
Edition:	52984
Material Type:	Research report
Physical Description:	17 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Advanced Wood Materials
Subject:	Fire
	Structural composites
	Laminate product
	Timber
	Hardwoods
	Testing
Language:	English

Abstract: The fire resistance of cross-laminated timber (CLT) could be improved by treating the lamina with fire retardants. The major issues with this technology are the reduced bondability of the treated lamina with commercial adhesives. This study assessed several surface preparation methods that could improve the bondability and bond durability of fire-retardant treated wood with two commercial adhesives. Four surface preparation methods, including moisture/heat/pressure, surface planing, surface chemical treatment, and surface plasma treatment were assessed for their impact on the bondability and bond durability of lodgepole pine lamina. The block shear test results indicated that all surface preparation methods were somewhat effective in improving bond performance of fire-retardant treated wood compared to the untreated control wood samples, depending on the types of fire retardants and wood adhesives applied in the treatment process and bonding process. The selection of surface preparation, fire retardant, and wood adhesive should be considered interactively to obtain the best bond properties and fire performance. It may be possible to effectively bond the treated lamina with PUR adhesive without any additional surface preparation for the fire retardant used in the treatment at FPInnovations.

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Real-time collection of temperature lapse rate data from aircraft for use in fire operations

https://library.fpinnovations.ca/en/permalink/fpipub53000

Author:	Baxter, Greg
	Thomasson, Jim
Date:	February 2020
Material Type:	Research report
Physical Description:	23 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Forestry
Subject:	Aircraft
	Atmosphere
	Lapse rate
	Temperature
	Fire fighting
	FPI TR
	Sensors
Series Number:	Technical Report ; TR 2020 n.24
Language:	English
Abstract:	FPInnovations investigated the possibility of collecting real time temperature-altitude data that could be used to determine the stability of the atmosphere. Unstable atmospheric conditions have been associated with erratic and extreme fire behaviour. An increased awareness of atmospheric stability conditions would provide fire managers an additional tool to plan firefighting activities. A firefighting aircraft with a specific sensor was sourced and two years of data was collected and analysed to determine if temperature profiles could be built using the data. Results show the data was sufficiently accurate and was collected at a frequency where temperature lapse rates can be calculated, and the stability of the atmosphere in the area of a fire could be determined.

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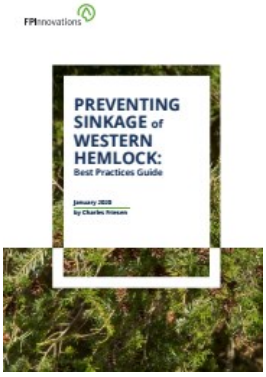

Preventing sinking of western hemlock. best practices guide

https://library.fpinnovations.ca/en/permalink/fpipub53003

Author:	Friesen, Charles
Date:	January 2020
Material Type:	Guide technical report
Physical Description:	12 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Forestry
Subject:	Trees Moisture content Water Transport
Series Number:	Special Publication ; SP 538
Language:	English
ISBN:	9780864885890
ISSN:	19250509
Abstract:	Hemlock can have higher moisture content than most other native trees, causing them to sink. Hemlock lumens have large pits (valves) that allow easy transport of water into the wood. Bigger rings = bigger lumens. Younger hemlock or hemlock tops are more susceptible to sinking. The bigger the rings the more likely to take on water.

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Geosynthetics design guide. Reinforcement solutions for unpaved roads

https://library.fpinnovations.ca/en/permalink/fpipub53008

Author:	Bober, Francis
	Thiam, Papa-Masseck
Date:	July 2020
Material Type:	Guide
	Research report
Physical Description:	47 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Transportation & Infrastructure
Subject:	Geosynthetics
	Soil
	Roads
	Reinforcement
Series Number:	Special Publication ; SP542
Language:	English
ISBN:	9780864886002
ISSN:	19250506
Abstract:	This guide provides users with easy to use charts to assist with the design of geosynthetic-reinforced unpaved roads over weak soils. It permits the estimation of key input parameters through simple procedures and judgment based on experience. Further optimization of designs may however be possible through detailed calculations and lab testing which are encouraged whenever feasible.

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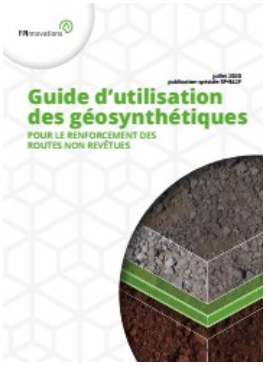
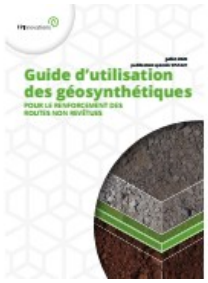


Guide d'utilisation des géosynthétiques pour le renforcement des routes non revêtues.

https://library.fpinnovations.ca/en/permalink/fpipub53009

Author:	Bober, Francis
	Thiam, Papa-Masseck
Date:	Juillet 2020
Material Type:	Guide
	Research report
Physical Description:	50 p.
Sector:	Forest Operations
Field:	Fibre Supply
Research Area:	Transportation & Infrastructure
Subject:	Geosynthetics
	Soil
	Roads
	Reinforcement
Series Number:	Special Publication ; SP542
Language:	French
ISBN:	9780864885999
ISSN:	07094523
Abstract:	Ce guide propose des graphiques simples d'utilisation afin d'aider les utilisateurs dans la conception de routes non revêtues renforcées avec des géosynthétiques. Il permet d'estimer les principaux paramètres d'entrée à travers des procédures simples et le recours au jugement découlant de l'expérience. Lorsque possible, le recours à des essais en laboratoire est préconisé pour l'obtention de certaines données d'entrée.

Documents



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Effet des paramètres de conception sur la performance vibratoire des planchers massifs en bois

https://library.fpinnovations.ca/en/permalink/fpipub53013

Author:	Hu, Lin J.
Date:	Juin 2020
Material Type:	InfoNote
Physical Description:	4 p.
Sector:	Wood Products
Field:	Sustainable Construction
Research Area:	Building systems
Subject:	Design
	Dowel-laminated timber (DLT)
	Floor
	Mass Timber
	Performance
	Vibration
Series Number:	InfoNote; 2020 n.5
Language:	French
Abstract:	La construction massive en bois est un terme générique qui englobe une grande variété de produits du bois épais et lourds, notamment le bois lamellé-croisé (CLT), le bois lamellé-goujonné (DLT), le bois lamellé-cloué et le bois lamellé-collé (GLT). À ce jour, les méthodes de conception à vibrations contrôlées ont surtout été élaborées pour les planchers en CLT.

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