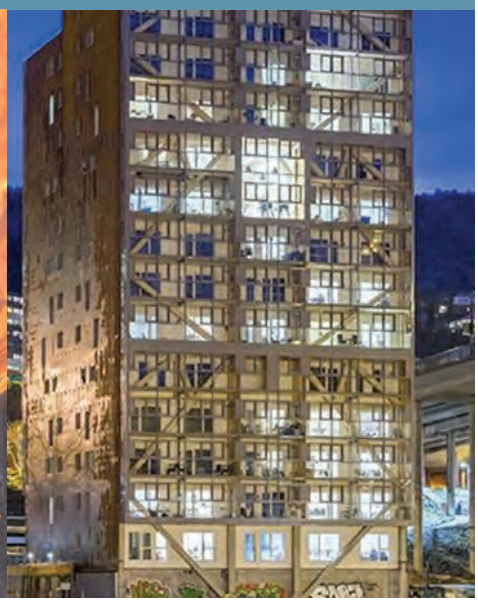
CSTB
le futur en construction

Tall Wood Buildings

Acquire new skills and know-how trough scientific excellence

Stéphane HAMEURY



Tall Wood Buildings

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Stéphane HAMEURY, Deputy Director
Business Unit Safety Structures and Fire

stephane.hameury@cstb.fr

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Tall Wood Building
Context

Mid-rise and tall wood buildings reflect an emerging trend in many cities around the world.

Brock Commons
Vancouver, Canada,
18 storey, 2016

Tour HoHo
Vienne, Autriche
24 storey
Attendue en 2018

Goupe Sumitomo Forestry
Japon
70 storey, 350 m
Project 2041

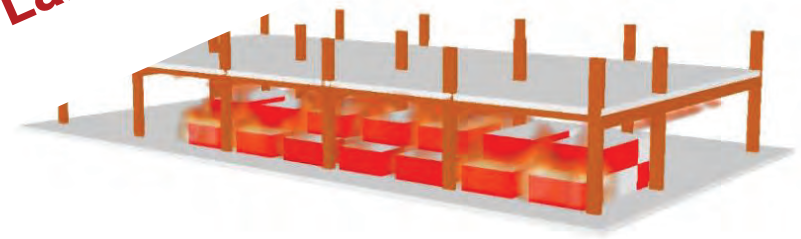
Scientific and technological advances are expected to support creativity and innovation

Tall Wood Building
Context

ADIVBOIS

Acquire new skills and know-how trough scientific excellence: Fire Safety Engineering

Can we demonstrate the self-extinguishment capacity of wood structu… function of the thermal action without any intervention of fire brig…



The subject will be discussed in the next session of the agenda « Large Scale Fire & Fire Safety Building Regulation

Acquire new skills and know-how trough scientific excellence: Structure

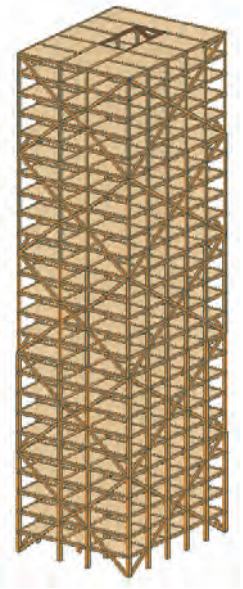
How to predict the dynamic response of tall wood buildings against wind?

European Project DynaTTB: ForestValue Joint Call for Research Proposals 2017

Overall objective of the project: To identify experimentally a number of full-scale TTB (Tall Timber Buildings) structures and, based on these, develop reliable dynamic models for predicting the dynamic performance of TTBs exposed to dynamic loading due to wind.

Scientific and technological objectives:

- To quantify the structural damping in as-built TTBs.
- To identify and quantify the effects of connections and secondary elements on the stiffness,
- damping and wind-induced dynamic response of TTBs.
- To develop a bottom-up numerical model for estimation of the dynamic response of multistorey
- timber buildings.
- To validate the predicted response with in-situ measurements on TTBs.



How to predict the mechanical resistance and the rigidity of timber connections for tall wood buildings? What is the effect of an aftershock on damaged connections for tall wood buildings? Which level of damage is acceptable to guarantee resilience?

Acquire new skills and know-how trough scientific excellence: Envelope

How to design and evaluate cladding systems compatible with tall wood buildings?

Type of cladding		Height of the building									
		≤ 6m	≤ 9m	≤ 10m		≤ 18m		≤ 28m		≥28m	
				Wind zone in France							
				1a to 3c	4d	1a to 3c	4d	1a to 3c	4d	1a to 3c	4d
Wood cladding (DTU 41.2)		YES	YES	YES	YES	YES	YES	YES	YES	-	-
Metallic cladding (CSTB 3747)		YES	YES	YES	-	-	-	-	-	-	-
Non traditionnal cladding	Open joints	YES	YES	YES	-	-	-	-	-	-	-
	Closed joints	YES	YES	YES	YES	YES	-	-	-	-	-
External Thermal Insulation Composite System		YES	YES	-	-	-	-	-	-	-	-

Acquire new skills and know-how trough scientific excellence: Environment

How to integrate temporary carbon storage effect in wood buildings?

"Whether or not to give a value to temporary carbon storage is a hotly debated issue among the environmental assessment community, and there is an increasing need for guidance on the subject."

Valuing temporary carbon storage. Available from: https://www.researchgate.net/publication/230674956_Valuing_temporary_carbon_storage

Acquire new skills and know-how trough scientific excellence: Health

Is it healthy to live in a wood building? (Provide field measurement of Indoor Air Quality in wood buildings).

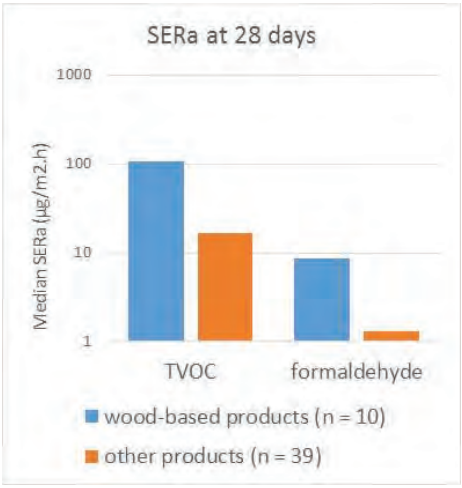
Natural or manufactured wood-based products exhibit specific emissions of several volatile compounds

→ **COMPARISON OF BUILDING PRODUCT EMISSIONS TESTED BY CSTB IN RECENT RESEARCH PROGRAMS**

> Higher emissions of TVOC and formaldehyde from wood-based products

→ **CHARACTERIZATION OF IAQ IN ENERGY EFFICIENT BUILDINGS**

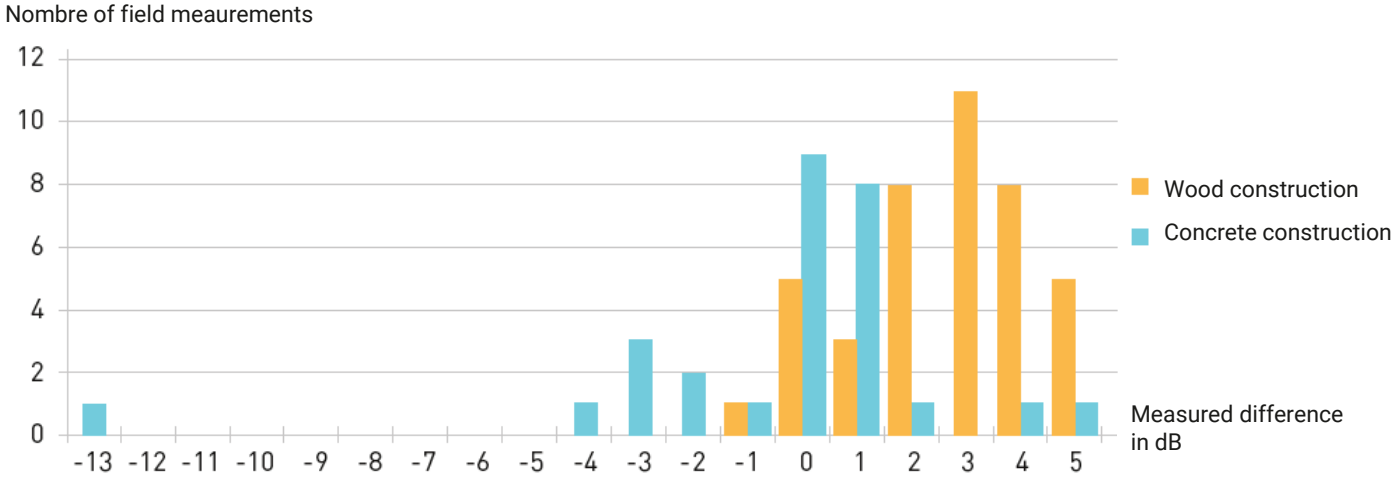
> Higher concentrations of light aldehydes (formaldehyde, pentanal, hexanal) and terpenes (limonene, pinene) in buildings with lightweight wooden structure (Derbez et al., *Indoor Air*, 2017)



Acquire new skills and know-how trough scientific excellence: Acoustic

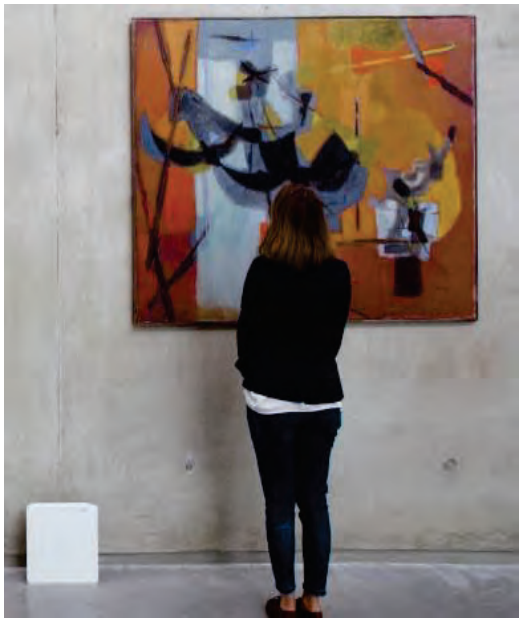
How to enhance the acoustic response of wood buildings at low frequencies?

Field measurement of impact sound insulation: with or without taking into consideration low frequencies < 100 Hz



Acquire new skills and know-how trough scientific excellence: Durability

In a sustainable world, are biocides still a valuable preventive response against fungi and insect's attacks in wood building?



An innovation protected by 6 patents, the fungal biodetector, developed by the CSTB, can detect molds and the development of fungi before they are visible, in order to protect and preserve heritage assets and works of art.

BIOGUESS
Biodetection to preserve people and heritage

A complete airborne contaminant surveillance and diagnosis system for indoor air is now offered by Bioguess, a subsidiary of the CSTB.

Acquire new skills and know-how trough scientific excellence: Perceived Comfort

How to characterize the perception of well-being when living in wood buildings?

Sensory perception

Objective method for multicriteria sensory analysis

PULSE
Pioneering hUman Laboratory for Sensory Evaluation

Determine methodology

SENSORY PANELS

Construction of test panel for the senses under consideration through implementation of Sensory Spaces based on Physiological Responses (ESRP) and the development of test protocols, questionnaires and related analyses.

Establish the sensory positioning of your product

SENSORY ANALYSIS

Conventional profile, free sorting, Check-All-That-Apply (CATA), Rate-All-That-Apply (RATA), triangle tests, hedonic tests, preference mapping.

Go beyond the reported feeling

PHYSIOLOGICAL MEASUREMENTS

Measurement of the emotional state or alertness of a subject.

Understand interactions

PHYSICOCHEMICAL ANALYSIS OF WATER AND MATERIALS

Objectively and quickly characterize the qualities of your product

OBJECTIVE METHOD FOR MULTICRITERIA SENSORY ANALYSIS

Combining physiological and physicochemical sensory analysis for objective interpretation of hedonic valence and perceived intensity of a stimulus (product or environment).

Acquire new skills and know-how trough scientific excellence: Economy

What is the market value for tall wood buildings? Discussion on construction cost and industrialization of tall wood buildings construction.

Joint research proposal to support creativity and innovation