FRENCH GUIDANCES ON THE USE OF SPRINKLERS TO PROTECT WOODEN APARTMENT BUILDINGS

CONTEXT : DECARBONIZE BUILDINGS

- Wooden construction Plan from 2009
- ELAN law (Evolution Logement, Amenagement and Numerique) in 2018
- SNBC (national strategy for low carbon)
- The Paris 2024 Olympic and Paralympic Games: neutral carbonized buildings (wooden based <28m)
- Increase of wood / timber in construction : 10%, 30%, 66%..are required in projects
- Use of biobased materials
- …

Paris 2024 – The Athlete's village

Source : parisecologie.com

STRUCTURAL & FAÇADE

Source : www.batireno.be

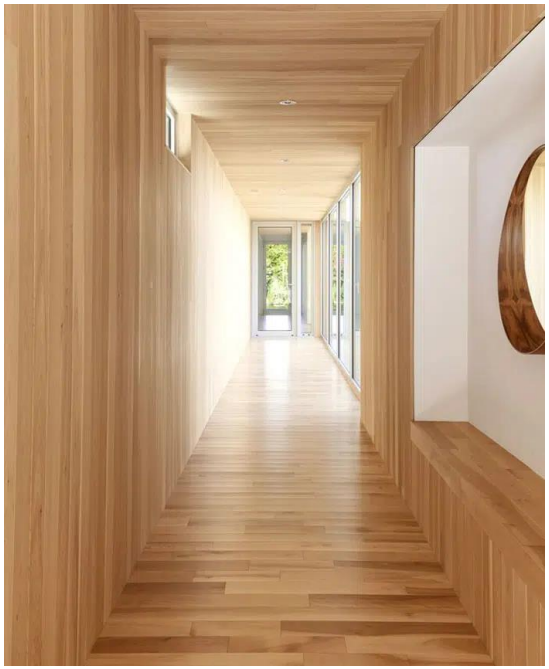
Source : www.inez.com.pl

Source : www.structrlam.com

INTERNAL LINING AND CIRCULATION

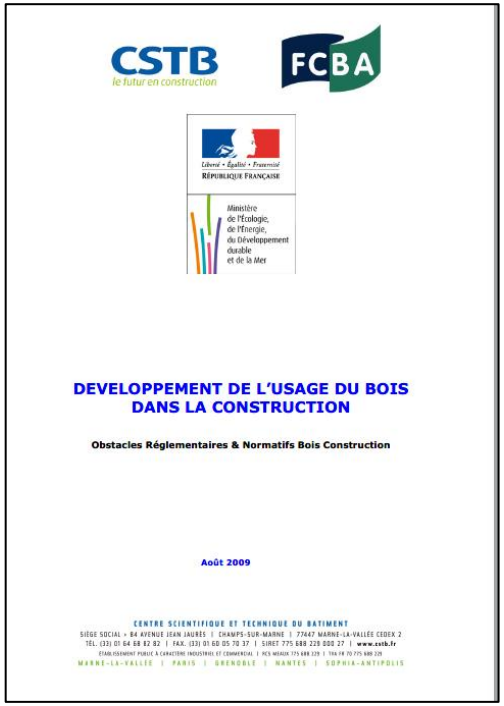
Source : www.amenagementdesign.com

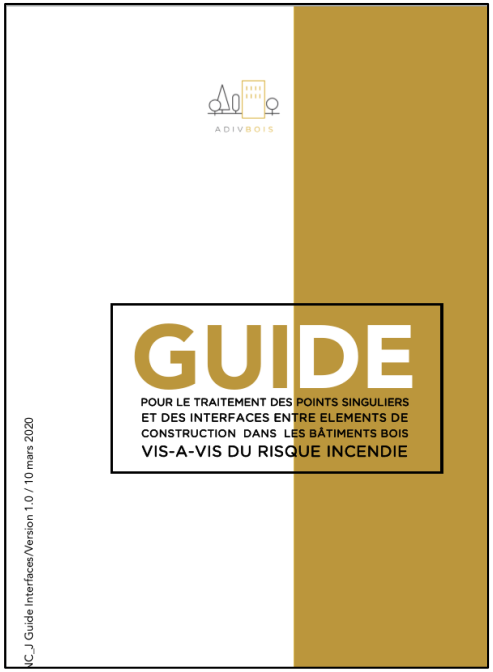
Source : www.bois-initial.ch

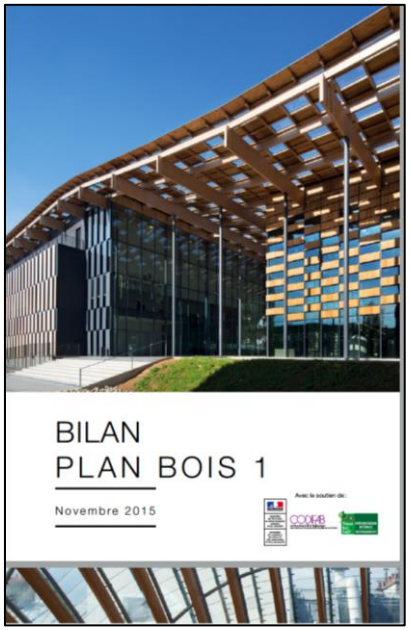


Source : www.amenagementdesign.com

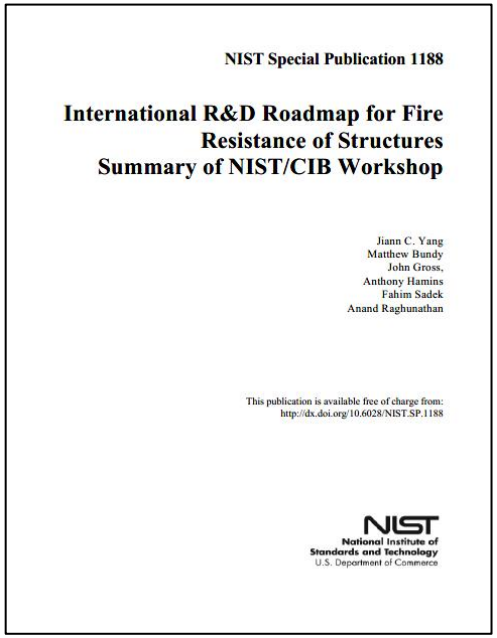
YEARS OF DISCUSSION IN FRANCE







YEARS OF INTERNATIONAL R&D



NIST Special Publication 1188

International R&D Roadmap for Fire Resistance of Structures Summary of NIST/CIB Workshop

Jiann C. Yang
Matthew Bundy
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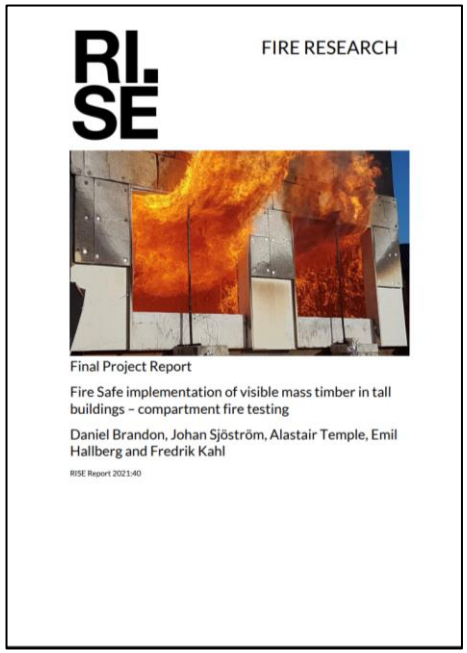
Anthony Hamins
Fahim Sadek
Anand Raghunathan

This publication is available free of charge from:
http://dx.doi.org/10.6028/NIST.SP.1188

NIST
National Institute of Standards and Technology
U.S. Department of Commerce



RI. SE

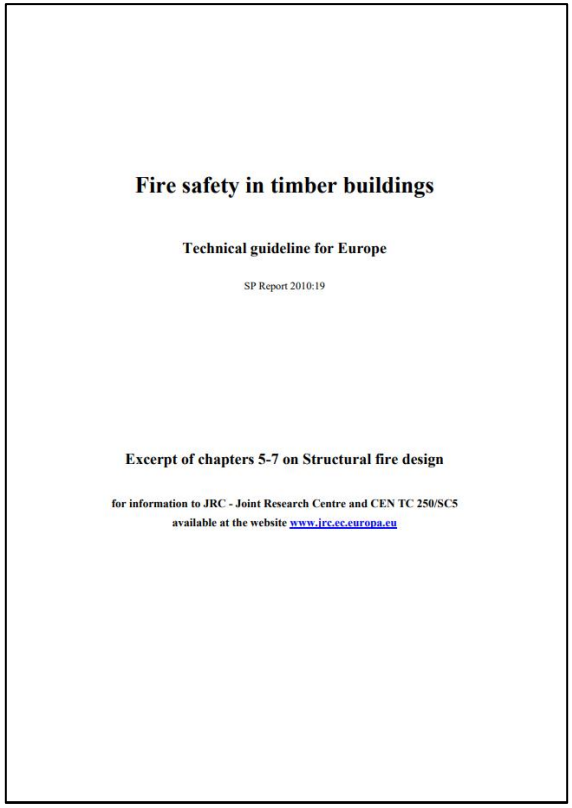
FIRE RESEARCH

Final Project Report

Fire Safe implementation of visible mass timber in tall buildings – compartment fire testing

Daniel Brandon, Johan Sjöström, Alastair Temple, Emil Hallberg and Fredrik Kahl

RISE Report 2021:40



Fire safety in timber buildings

Technical guideline for Europe

SP Report 2010:19

Excerpt of chapters 5-7 on Structural fire design

for information to JRC - Joint Research Centre and CEN TC 250/SC5 available at the website www.jrc.ec.europa.eu

FEED BACK FOR REAL FIRES

San Francisco - 2014

Draguignan - 2019

Saint Denis de la réunion -2021

➔ **Growth of timber use in construction is increasing the fire risk if not well monitored**

A NEED OF REGULATION EVOLUTION

Requirements can prohibit wood in construction :

- Reaction to fire
- Uncombustible materials

Regulation based strategy does not cover a large use of wood in construction : How to satisfy a fire safety objective and the functional requirements ?

- Fire growth
- Rate of heat release
- External flaming and propagation
- Fire duration
- Fire propagation between compartments
- Fire stability
- Fire propagation to neighbours
- Glowing fires

Combination of measures:

- Passive measures including the review of construction details
- Active measures
- Firefighters' Operation

« PREFECTURE DE POLICE » DOCTRINE

Protection	h<8m	8m<h<18m	18m<h<28m	28m<h<50m	h>50m
vertical circulation	//	incombustible material	incombustible material	incombustible material	incombustible material
horizontal circulation	//	passive protection OR active protection	passive protection	passive protection	passive protection
structural elements	//	partial passive protection OR active protection	passive protection OR active protection	partial passive protection AND active protection	passive protection AND active protection
protection between compartments or tierce user					
limit of compartment	REI30	REI 60	REI 60	REI 90	REI 120
separative elemnt each 45m	incombustible material	incombustible material	incombustible material	incombustible material	incombustible material
protection tier above	REI 120	REI 180	REI 180	REI 180	//
distance between building <8m without sleeping room	E60 D-s3,d0	E60 D-s3,d0	E60 A2-s3,d0 or laboratory assessment	E60 A2-s3,d0 or laboratory assessment	//
distance between building <8m with sleeping room	E60 D-s3,d0	EI60 A2-s3,d0 or laboratory assessment	EI60 A2-s3,d0 or laboratory assessment	EI60 A2-s3,d0	//
distance between building >8m	D-s3,d1	A2-s3,d0 or laboratory assessment	A2-s3,d0 or laboratory assessment	A2-s3,d0 or laboratory assessment AND "visa de façade"	"visa de façade"
firefighing means					
water		180 m^3/h (2h)	180 m^3/h (2h)	180 m^3/h (2h)	180 m^3/h (2h)
means for firefighting	manual extinguishers	manual extinguishers	dry hose reel	dry hose reel	wet hose reel

SDIS 33 DOCTRINE (BUILDING WITH PBDN >8M)

- Structural fire stability R60 minimum
- Staircase with uncombustible material
- Horizontal routes with protected wooden walls
- Reinforced control of detailled design
- Fire resisting walls and floors
  - Without air gaps **or** protected by a screen with same fire rating
- Unprotected timber construction
  - Fixed fire fighting system is implemented

    or

    In case of beam/column design, FSE demonstrates the fire stability according design fire scenarios
  - Dry column and fire hose from Level 4

SDIS 33 DOCTRINE (BUILDING WITH PBDN >28M)

- ❑ Structural timber is protected
- ❑ Fixed fire fighting system is implemented
- ❑ Dry column and fire hose from Level 4
- ❑ Water supply > 120 m^3/h
- ❑ Fire hydrant at less than 500m
- ❑ Specific analysis for heat flux to other building
- ❑ Specific accessibility to façade

WOODEN BUILDINGS AND FIXED FIREFIGHTING SYSTEMS STANDARDS

- From current Fixed FireFighting System standards :
  - EN 12845
  - EN 16925
  - EN 14972
  - EN 12259

- No specific classification of such risk :

  OH 1 – OH 2 – OH 3 – OH 4 ???

- No specific requirements for such risk :

  No information about combustible walls
  No historical data for combustible walls

- Annex A of EN 14972 : Guideline for developing representative fire tests protocols for Water Mist Sytems

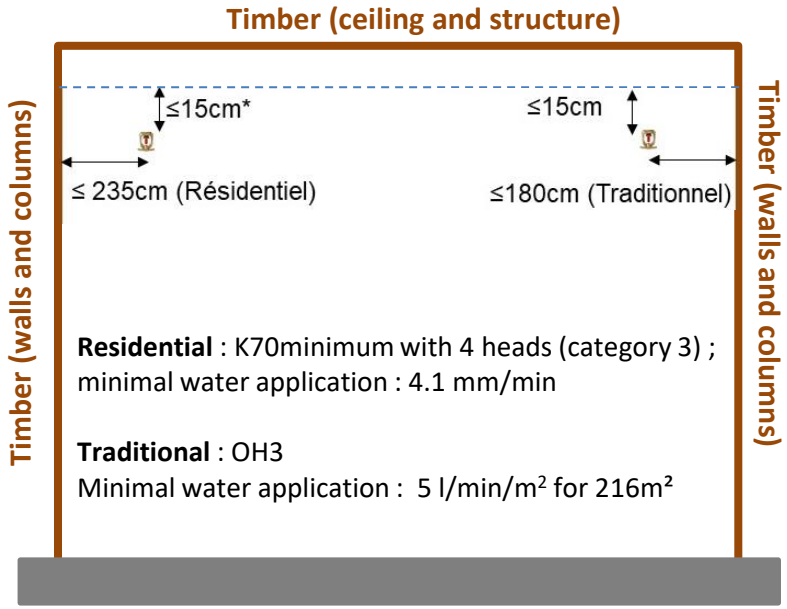
EFECTIS (&CNPP) PROPOSAL

Unprotected timber structure building

- Watermist NF EN 14 972
- Residential sprinkler NF EN 16 925
- traditional sprinkler NF EN 12 845

Specific design

Minimal requirements
- Head qualified by tests with timber
- Test protocole established according EN 14972
- Design taking into account wood walls
- Design and installation according to CIFM manual



Pumps with thermal energy or electrical with back up supply

Accessibility of the sprinkler room from outside

EFECTIS (&CNPP) PROPOSAL

Partially protected timber structure building
For Medium and High rise building (PBDN > 28m)

Objective : fire stability and non contribution of timber when fire declines

Optimisation

Pre-design fire for accepted unprotected timber surface:

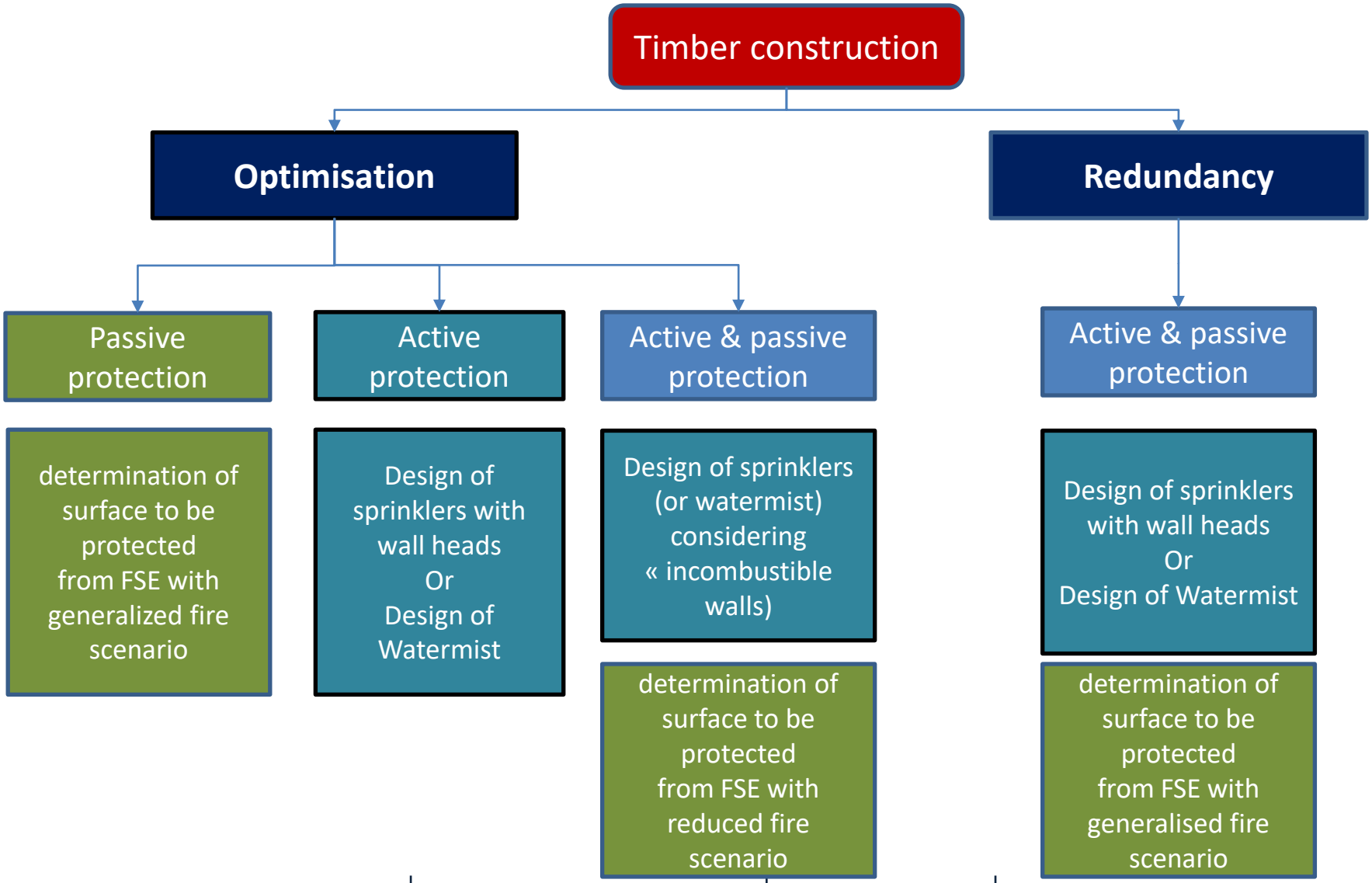
Residential sprinklers (OH) (correspond to a number of heads)
64% - S < 16m²,
16m² for S < 25m²,
22m² for S < 35m²,
32m² for S < 50m²,
48m² for S > 50m²

Traditional sprinkler (LH) or water mist :
48% - S < 12m²,
12m² for S < 25m²,
24m² for S < 50m²,
48m² for S > 50m²

Redundancy

Design of unprotected timber surface according Fire Safety engineering process

EFECTIS (&CNPP) PROPOSAL



Under Construction …

Dwellings

source : pinterest.fr

Offices

source : projects-archiexpo.fr

Buildings with public

source : charpente-emg.com

THANKS FOR YOUR ATTENTION