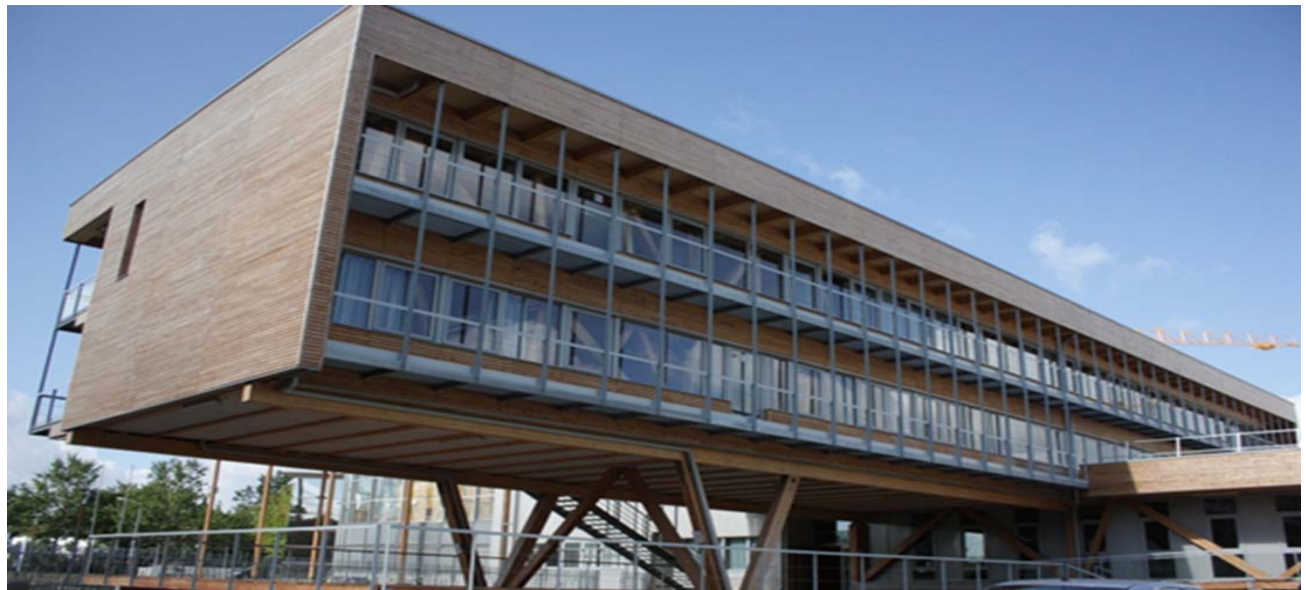Enseignement – Recherche
Sciences & technologies du bois

GROUPE
ESB

Groupe École Supérieure
du Bois
*Higher Education and
Research-*
*Wood Science and
Technology*

The monitoring as a tool to improve performance modelling and service life assessment of timber structures

COST Action FP1303
27-28 January, 2014

Research objectives

- Structural design (mainly deterministic) considers only partially the structure under service and environmental conditions

- This approach can lead to overdesigned structures

- The difference between designed and real behaviours can be significant for timber, as strongly influenced by service and environmental conditions

- The construction of the new building of the ESB offered a great opportunity to follow its global performances with time
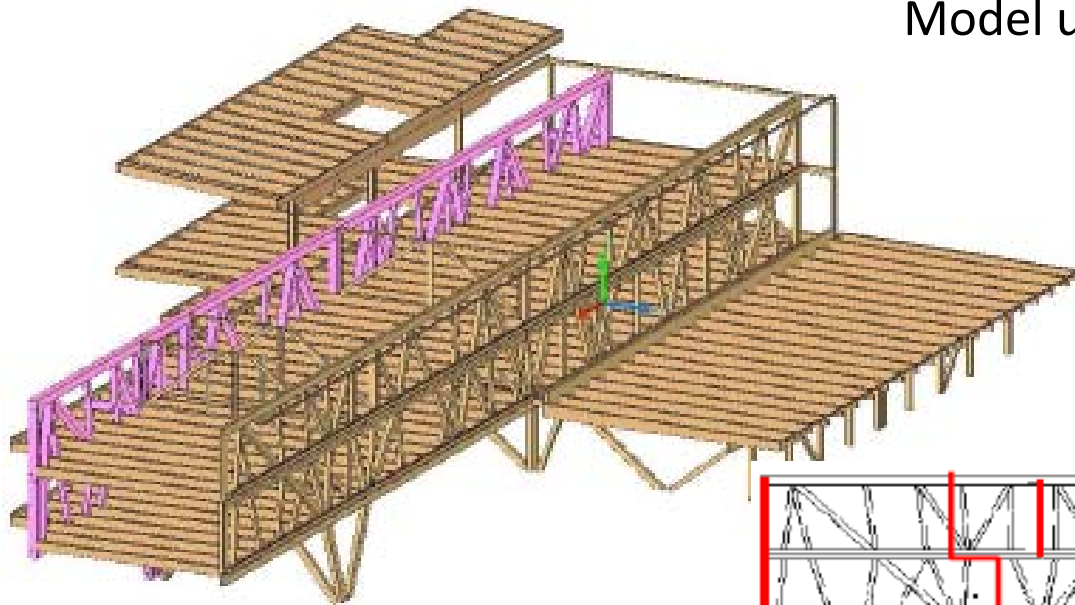
The structure

- Three-floor structure: wooden trusses and composite concrete-wood slabs. Trusses : length of about 40m on three supports plus a cantilever span of about 8-9m
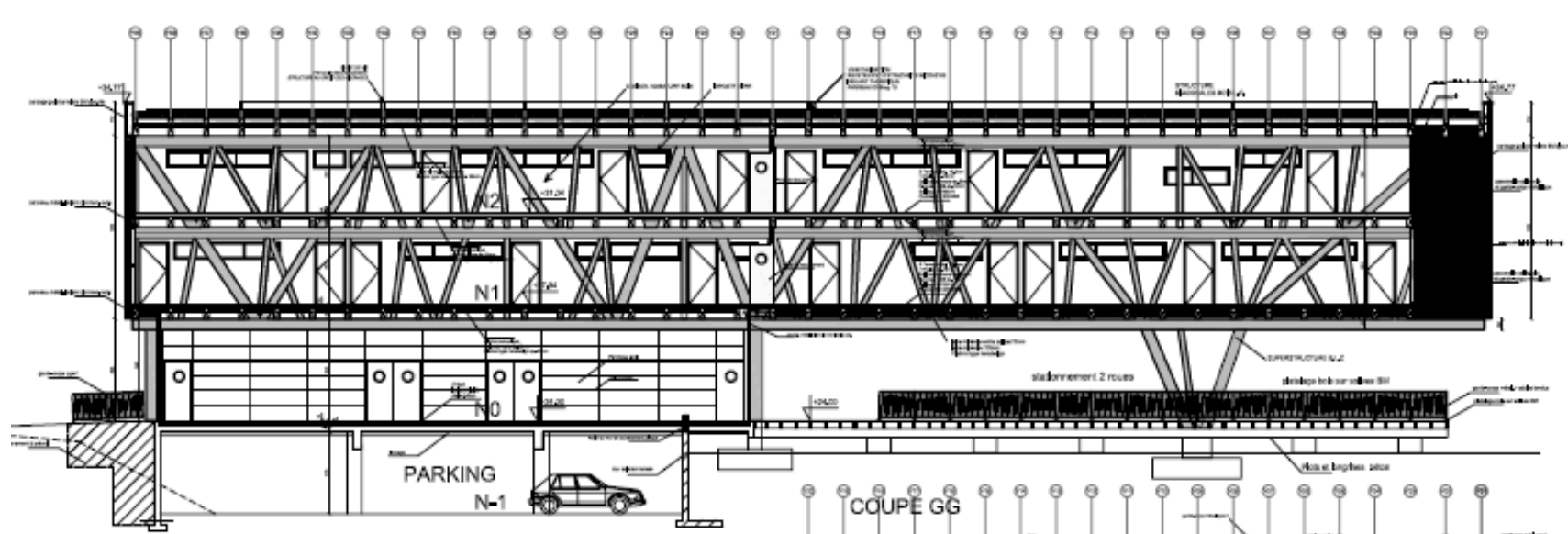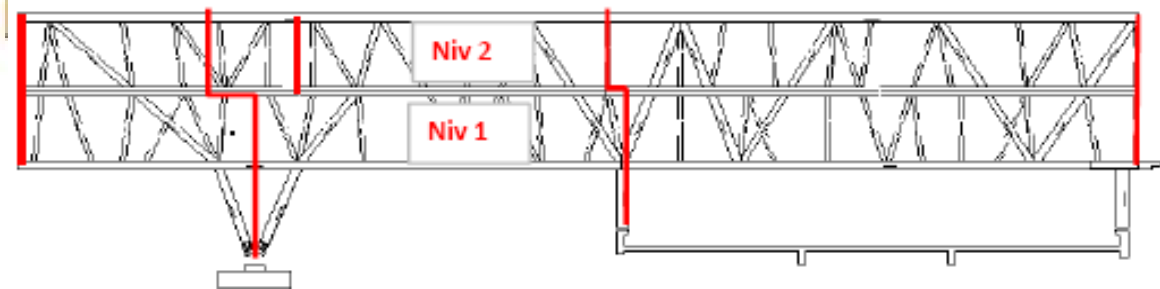
The structure

- Design

Model used for the design

Wind bracing system

The structure

- Construction

The structure

- Construction

The aim

- Follow the structural response during the service life

- Understand the structural behaviour in relation to environmental changes (temperature and humidity) and to operational charges

- Compare the design assumptions with the in-service response

- Disseminate feedback and up-to-date results to the industry, code writers, users, etc.

Strain/stress sensors

- Verify the hypothesis of negligibility of bending moment in the semi-continuous diagonals and in columns

- Measure the stress level of the superior and inferior beams, of some minor members and of few connections

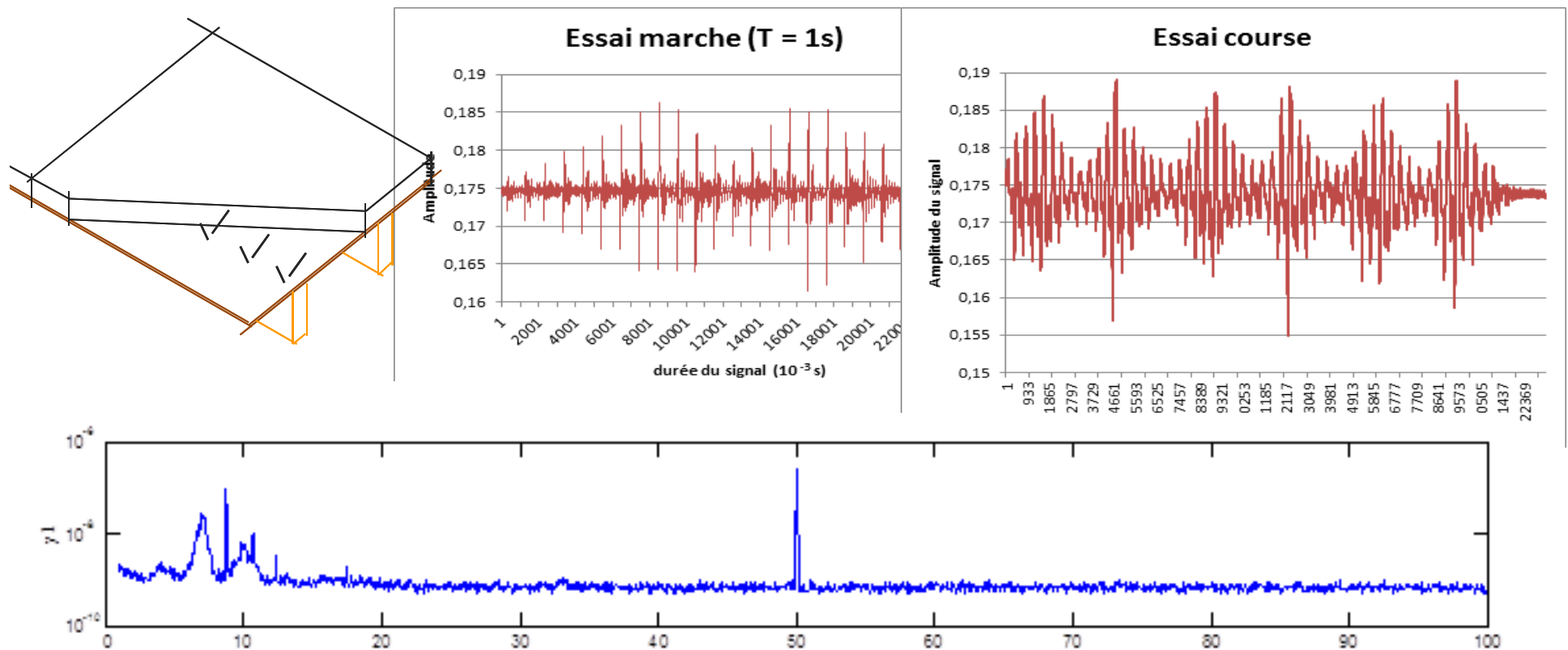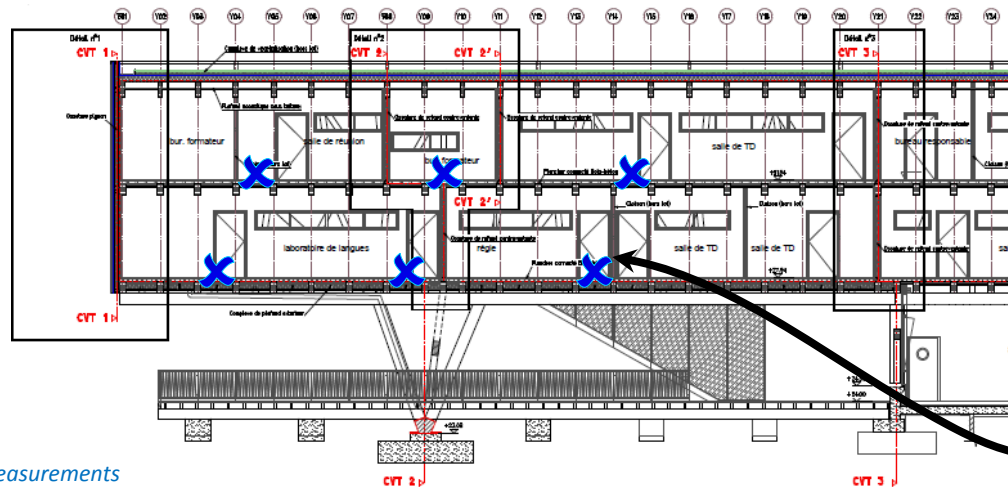- Deeply investigate the cantilever span movements
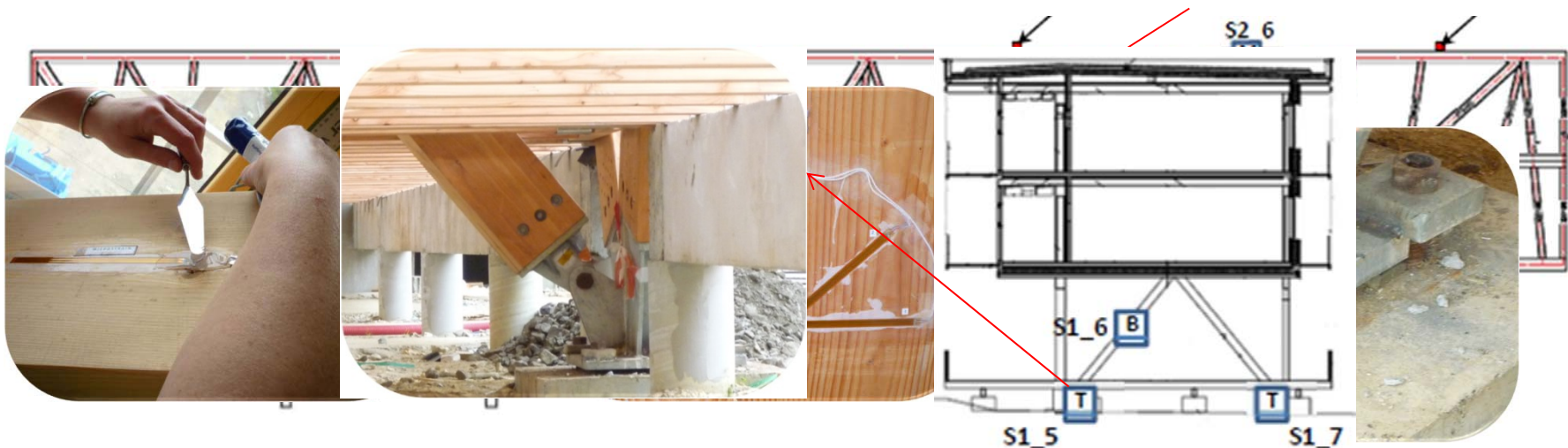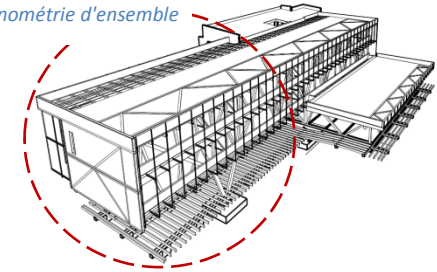
Walls equipment
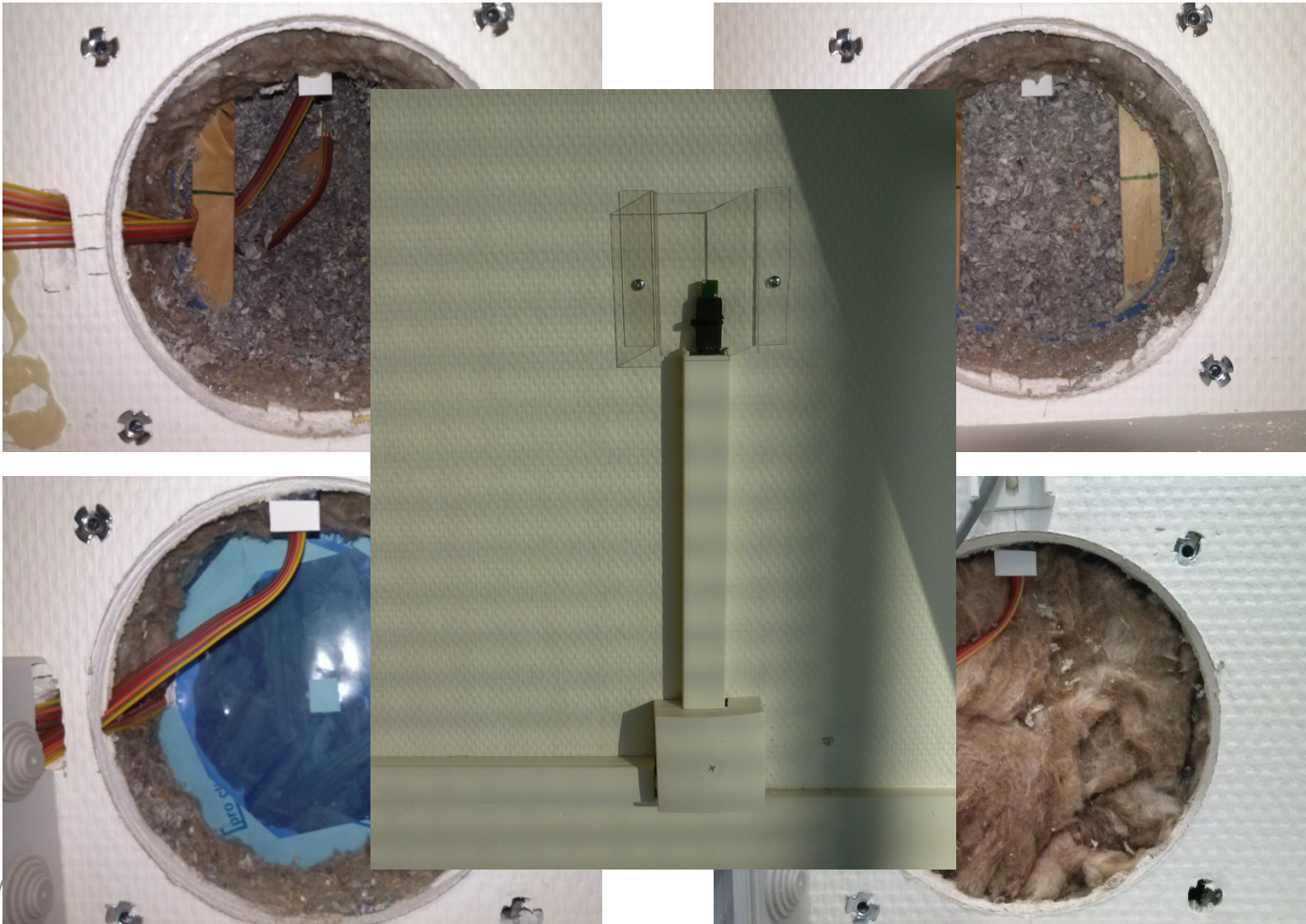
Dynamic measurements

- Composite slab vibration

Measurement tests

Axonométrie d'ensemble

✗ measurements

- Environmental noise
- Impact tests
- Walking tests

▶ 6 measurement setups
▶ 3 accelerometers

On-going developments

- Dynamic and static monitoring : data analysis and interpretation

- Thermal modelling of walls performances

- Connections and material: local modeling influence on structural behaviour

- Comparison of different structural systems

- New timber buildings to monitor and increase the database

- New sensors application on wood (e.g. fibre optic)

Conclusions

- For timber structures, at the material scale:

    – Many researchers on material assessment

    – Modelisation of material laws

    – Mainly at laboratory scale but few in-field applications

- For timber structures, at the structure scale:

    – Several applications/models on the thermal behaviour

    – Few applications on mechanical behaviour, at the element scale mainly

    – Modelisation very complex due to connections behaviour

    – Need to follow and understand the real in-service behaviour