Dynamic Response of Tall Timber Buildings under Service Load – first results

Project objectives:

Develop numerical FE-models for estimating the dynamic response of tall timber buildings.

Validate the predicted response with in-situ measurements on TTBs.

Disseminate findings via a TTB Design Guideline for design practitioners.

Wind-induced dynamic excitation is becoming a governing design action determining size and shape of modern Tall Timber Buildings (TTBs). The wind actions generate dynamic loading, causing discomfort or annoyance for occupants due to the perceived horizontal sway – i.e. vibration serviceability failure. Although some TTBs have been instrumented and measured to estimate their key dynamic properties (natural frequencies and damping), no systematic evaluation of dynamic performance pertinent to wind loading has been performed for the new and evolving construction technology used in TTBs.

During December 2019 and January 2020 full-scale measurements was performed on the first two buildings, CSTB performed measurements on the building Treed-It in Paris and University of Exeter performed measurements on the building Yoker in Glasgow.

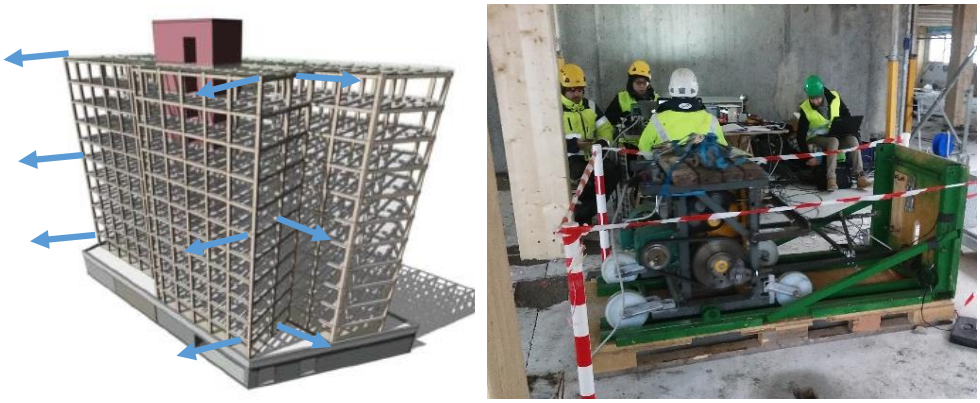

Figure. Structure of the building Treed-It in Paris, designed by Vinci Engineering with Arbonis as main contractor of the timber parts, and a photo from the full-scale measurements with CSTBs shaker in operation in the building.

The preliminary results from the Treed-It building show a first natural frequency of around 1.4 Hz which slightly higher than the first FE-modelling results. Those results show that the FE-model calculates on the safe side now but that there is room for optimization of the model. For the bending mode structural damping was close to 2.5% of critical for large amplitudes and reduced to 1.5% of critical for smaller amplitudes.

The project will provide valuable information concerning the FE modelling of high-rise timber buildings, to be used by designers for assessing the comfort of end users. The data regarding damping of such structures will be one of the main outputs of this European research.

Project facts
Project title: Dynamic Response of Tall Timber Buildings under Service Load – DynaTTB,

Project time: 36 months,

Start date: 2019-03-01

End date: 2022-02-28

Web: www.dynattb.com

Partners: