Numerical Models for Dynamic Properties of a 14 Storey Timber Building

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Summary:

The world tallest timber building with height of 45 meters, is planned for Bergen, Norway. In this master thesis the dynamic properties of the case building, as proposed by Sweco and Artec, are investigated. The proposed structural concept with a glulam frame and power-storeys, have never previously been built, and it is desirable to develop and understanding of the dynamic problems concerning this building. Previous work have shown problems with acceleration levels for tall timber building, mostly due to the material properties of timber. Timber has high flexibility and strength combined with low weight. The main aim of the work have been to build a 3D-model of the case building in a finite element program, where numerical methods can be used to find the dynamic properties of the building. The wind load and acceleration levels are investigated, and found to be reasonable compared to various criterions presented. The effect of the stiffness in the connections, as well as the use of apartment modules are investigated. In addition a dynamic analysis is run, and stochastic subspace state space system identification is used to verify the model. This can later be used for verification of the actual building when finished, and will be an important method to determine the actual damping and stiffness. Based on the findings in this work, the concept is assumed feasible, possible with some changes an even better concept is achieved. It will be exciting to see how Sweco will develop the concept further in the next planning phase.

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