# CASE STUDIES OF BRACING SYSTEMS FOR MULTISTOREY TIMBER BUILDINGS UP TO 20 STOREYS

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Europe has a long tradition of multi-storey timber based urban buildings. In the last century cement based buildings dominated completely the market in central Europe but for several years modern timber constructions are developed. In modern timber buildings big openings in the façade are getting more common. This is why innovative bracing systems are desirable and should be more investigated. A short summary of 3 projects related to the subject of earthquake resistant multi-storey timber buildings will be given.

Project 1: "Multistorey timber building for Vienna"
A five storey timber building in Vienna was analysed. Such a building could resist wind and seismic loadings in Vienna.

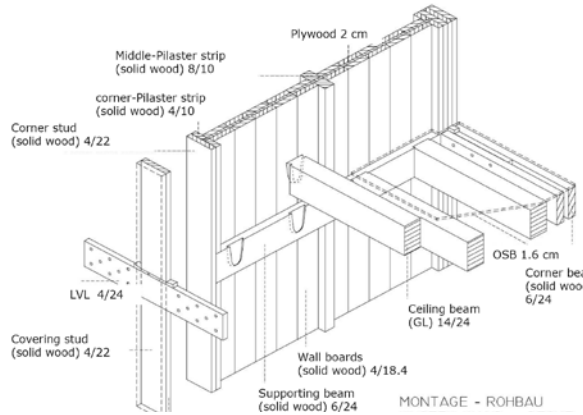


**Fig 1.** Wall–Floor details

A two storey prototype was built to test the static and dynamic behaviour

**Fig 2**. Erected Prototype

Project 2: “Bracing system for multi-storey timber building in Italy using slender shear wall elements in cross-laminated timber (CLT)”
The aim was to minimize the number and size of the shear walls provided to resist seismic loads by using stiff massive panels and non-conventional high performance anchorage systems in steel.

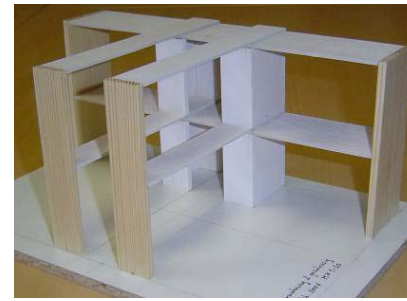

**Fig 3.** 3D – model of stiffening walls and “propeller-system”

One objective was the optimal board configuration of CLT walls for resistance against lateral forces.
Under cyclic loading perpendicular laminated timber panels decreased their stiffness more significant compared to inclined laminated timber panels

**Fig 4.** Dynamic testing of hybrid wall system with inclined boards

Project 3: “The feasibility of a possible 20 storey height timber office building”
The aim of this ongoing project is to investigate the seismic behaviour of a highrise timber building without diagonal bracing.
The resulting loads of the dynamic analysis are very low due to the high flexibility of the structure
(T1= 4.58 s).
We assume that load case wind will be significant for the tension anchor forces and the inter-storey drift.

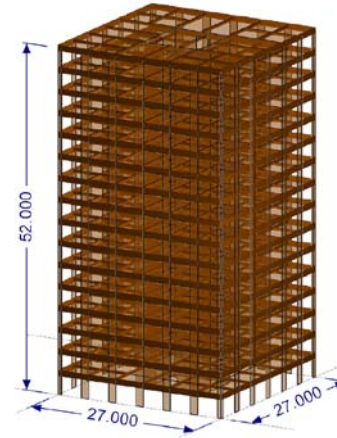


**Fig 5**. Perspective view