

Can CLT compete with concrete? Feasibility of Stora Enso Multi Storey Solution

Ist CLT gegenüber Beton konkurrenzfähig?
Machbarkeitsstudie von Stora Enso Multistorey Solution

Le CLT – capable de concurrence face au béton ?
Etude de faisabilité par Stora Enso Multistorey Solution

Il compensato multistrato è concorrenziale nei confronti
del calcestruzzo?

Studio di fattibilità di Stora Enso Multistorey Solution

Matti Mikkola
Stora Enso Wood Products
Helsinki, Finland



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Due to the new EU legislation, the national regulations and consumer behaviour the housing design in Europe is facing new challenges. Energy saving and limitation of climate influence will deeply affect design, choice of material and organization of production. Higher quality requirements and tested performance are driving forces to industrialize the housing industry. Without a doubt it will be a crucial change in the market and it will affect our future production systems. The timber systems are well off in this development but have to be further developed not to be overrun by other systems.

Interests in the public and the private sector have been pushing the development of timber based large scale dwelling projects during the last decade. Several buildings have been realized throughout Europe and a great part of them in Sweden, Austria and Germany. At present, the discussion is driven around the issue of price, and how timber buildings are or can be competitive to common mineral based materials in the building domain. Thus, the aim of the study was to focus primarily on the cost competitiveness of timber based building systems for the dwelling and the office sector in Sweden, Finland, Austria and Germany.

In Sweden, Finland and Austria, the size of the multi-storey new residential buildings is approximately 15.000 living units per year, of which half is built in the largest cities in medium to large residential projects. The concentrated market for example in Vienna is developed mostly with middle rise (up to 7.5 stories) buildings, where timber has not yet been proven. In answer to the demand and better acceptance of wood, the market in the federal states is based on smaller scale projects, where timber is more widely accepted, but projects are more dispersed in terms of geography, business operations, regulations etc.

1. Increasing demand and also some well established markets

In Germany, there is an increasing demand for retirement residences, which are particularly concentrated in larger cities. The demand for new residential buildings has decreased in most of the country; exceptions are Munich and Frankfurt, which at the moment have launched a subsidy for ecological housing.

Most of the first timber buildings were driven by public policy to increase the use of wood in the multi-storey timber residential sector; at present - after programs like "Holz in der Stadt" Competition - these initiatives have been claimed to come to an end. At the moment, timber based building systems are expected to compete in the market without political help.

On the other hand, timber construction in residential multi-storey housing is well established and accepted in Sweden. Timber has a high market share, probably the highest in Europe. And this market share has been reached mainly without support from the traditional construction industry, subsidies or the government.

Some timber multi-storey dwellings have been recently built also in Austria outside public policy and show that it is technically and economically possible to use timber based building systems in the subsidized dwelling sector. Five or more storey buildings have not yet emerged; important exceptions are a 7 storey building in Berlin (another one on the way) and the Wagrammerstrasse project in Vienna, which is still waiting for a clear definition regarding fire regulations. There is a general idea that the increasing demand for environmentally friendly urban development will push the timber based buildings during the next years.

Depending on the country, the building regulations allow the use of timber as structure in constructions up to 4...8 stories. Above 4 floors its use is still matter of discussion in

many countries. The fire regulations are an important limitation regarding the use of timber in building higher than 4.5 stories.

2. Material costs as such are higher – real gains from time savings

A cost comparison of timber based and mineral based building components shows that timber components tend to be more expensive than the mineral based ones as used at present. The additional costs observed in the component study, may be partly countered by savings during the construction time and in other trades of the building; on the other hand, other trades may have additional costs in a timber project. To study these variables, totally five recently built projects (in concrete) in three countries were translated into a timber structure in order to compare the costs and understand the variations in the value chain of the construction process.

The initial cost estimation of the translation to timber was done by the main contractor, and the price difference was around 10% costs over-run for the wood based solution. Additional costs of the CLT structure and other details were considered but no savings were taken into account. A detailed calculation of the cost of the load bearing structure shows that the calculation was too far on the safe side, and a more precise estimation would narrow the difference. The comparison done in the building component level mixes two variables: mass calculation by cost/m² and difference in Usable Living area under the same gross area. The result shows that the over price of the timber building is reduced to approximately 5%.

In the study of the overall construction costs, it was observed that most of the price difference may be absorbed by the time savings (under the "preliminaries" trade). Also, it is suggested that most of the price difference is manageable within the strategic pricing ranges. In an optimistic scenario, most of the higher costs of a CLT based project may be absorbed within the real estate operations. Depending on the availability of the main contractor to reduce its safe estimations, the price competitiveness of timber building may be in the residential building market dominated by middle rise buildings. The competitiveness may be higher in special projects related to ecological urban development and where construction time is a relevant factor.

Besides the price discussion, a critical limitation for timber is the lack of main contractors willing to build wood based projects; this has kept several initiatives from realisation. Common carpenter firms are usually too small to act as main contractors and they can participate only as carpenters.

3. Competitiveness is there – wide cooperation and quality control needed

4 - 5 stories dwellings is the section of the market where CLT based solutions appear to be more competitive, but the 7.5 storey buildings must be considered for developments f.ex. in Vienna. Office buildings, due to longer spans, higher loads and expensive steel connections, are less price-competitive than the residential buildings; but in this type of building qualitative and special decisions are more relevant than the cost discussion. Work environment and/or corporate image are key aspects for a decision towards timber in this kind of buildings. For this market, more economical solutions for long spans are required.

Environmentally friendly yes, sustainable yes, energy efficient yes, produced out of renewable material yes, acting as carbon sinks yes, more expensive NO. Pre-fabricated CLT based building system is able to compete against concrete. CLT has all the possibilities to be the leading material and solution in multi-storey buildings. This requires cooperation between the companies in the European standardization work, industrial approach both in the component/element production as well as in the total building process.

Finally the whole woodworking sector, regardless of the building system, needs a bullet proof quality system before, during and after the building project to secure the satisfaction of the user of the building, our customer.