

Timber (CLT) technique, in which the vertical and horizontal elements of a building comprise massive wood panels in which adjacent layers of boards glued crosswise to each other. Owing to the easy coupling technique, air-tightness, and the good rigidity, CLT is competitive especially in tall wooden multi-storey buildings. Finland's first CLT factory has been built in Kuhmo, where domestic CLT production began in September 2014. Also increasing in popularity in multi-storey wood construction is CLT-based prefabricated modular unit technology. The dry, light, and fast method of construction, which is largely prefabricated at the factory, shortens construction time, thereby reducing the total costs of construction.

National wood construction programme 2011–2015

In Finland the Ministry of Employment and the Economy has headed a National Wood Construction Programme under the Strategic Programme for the Forest Sector, for 2011–2015. The goal of the wood construction programme is to diminish the carbon footprint of construction by significantly increasing the use of domestic wood in construction. The aim is to make Finnish wood construction an international brand by combining good architecture and design with environmentally conscious and energy-efficient building with intelligent building.

New targets for wood construction have constantly been sought in the name of the programme, in collaboration with Finland's most important builders, construction companies, and municipal decision-makers and zoning authorities of

growth centres. The aim has been to get construction projects that are bigger wholes than just individual buildings, in which wood is used in an appropriate and competitive manner.

Education in wood construction has been updated at all levels of institutional education in Finland in order to be able to respond to growing demand for large-scale wood construction. Project, research, and development activities of wood construction on a national scale have also been honed, unified, and enhanced to make them more efficient, by increasing cooperation and communication among players in the field.

The government wants to advance wood construction also from the point of view of regional economy and employment. Increased use in of wood construction can also help boost demand for wood products and exports, and in doing so to create nearly 6,000 new jobs in Finland.

Good competitiveness is a basic prerequisite for the internationalisation of the wood products field. To promote internationalisation and growth, a shared service platform has been established for companies in the business (www.woodproducts.fi) and a shared "Stories of Wood" wood brand work for the field is being set up. In addition, a corporate growth and anchor tenant models have been created for improving competitiveness in the field, and for combining production, product development, network, and market know-how. Promotion of exports has been systematised and enhanced in government-corporate cooperation according to the Team Finland approach.



Contact information

Markku Karjalainen
Development Manager
markku.karjalainen@tem.fi

Ministry of Employment and the Economy,
Strategic Programme for the Forest Sector
P.O. Box 32, FI-00023 GOVERNMENT

Telephone switchboard: +358 029 516 001
www.tem.fi/mso



Status and possibilities of wood construction in Finland



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MINISTRY OF EMPLOYMENT AND THE ECONOMY

Wood construction as part of the forest industry

The forest sector is very important for the Finnish national economy. It covers a fifth of Finland's export income, 5 per cent of the gross domestic product of the entire country, employs some 200,000 Finns, and produces around 70 per cent of the renewable energy in Finland.

Every year, Finland's forests grow and produce nearly 110 million cubic metres of wood and, of which 60-65 per cent has been utilised. The utilisation of wood could be significantly increased (by approximately 20 million cubic metres per year) by, for example, increasing its use as a source of energy, in construction, and in the wood-product industry, and in various bioproducts. Approximately four fifths of

the sawn timber consumed in Finland is used for construction purposes. Housing construction plays a key role in construction: residential buildings account for more than 70 per cent of Finland's building stock.

Wood construction in fighting climate change

As global climate, environment, and natural resource issues gain in significance, new markets are being sought for wood construction even in Finland. The biggest opportunities for growth in wood construction in Finland are in multi-storey construction, public buildings, warehouse, and industrial buildings, silos, yard construction and landscaping, as well as energy upgrades of facades in suburban houses, in adding storeys to buildings, and complementary construction.



New energy-efficiency regulations took effect in Finland on 1 July 2012. These regulations aim at the construction of more energy-efficient buildings, and at encouraging the use of more renewable energy in heating and cooling buildings.

No later than 2017 Finnish building standards will take into account energy efficiency and environmental impact issues in construction - so-called carbon footprint reviews. As a domestic, local, renewable, and ecological energy source and construction material, wood will be an increasingly competitive raw material in this respect.

Small-scale construction favours wood

There are half a million summer cottages in Finland, and the number is growing, as some seven thousand new holiday houses are built every year. Of these, almost 99 per cent are made of wood. The dominant posi-

tion of log-based building in the construction of cottages is unswerving.

There are 2.85 million registered residences in Finland, and over the past twenty years, some 30,000 new residences have been built every year. Detached houses - i.e., single-family and two-family houses - account for slightly less than half of the production of new housing. More than eight out of ten detached houses have a timber frame and some three fourths have a wooden façade.

Finland breakthrough of multi-storey wooden buildings

Finland has the second highest proportion of multi-storey buildings in Europe, right after Spain. About 44 per cent of all residences in Finland are in multi-storey buildings. Each year between 13,000 and 15,000 residences are built in blocks of flats each year.

Wood-based construction has undergone intense development in Finland since the early 1990s, through close co-operation with other EU countries. Development efforts have focused particularly on large-scale wood construction and on enhancing buildings' energy-efficiency. Finnish fire-safety regulations were changed on 1 September 1997 to allow the use of wood in building frames and façades for buildings of up to four storeys. Fire codes were changed again on 15 April 2011, to allow for the use of wood also in residential and office buildings of 5-8 storeys with a wooden frame and façade. In addition, the possibilities for using wood were extended to cover repairs of and extensions to concrete sub-urban buildings.

In Finland wooden buildings of more than two storeys must be equipped with automatic fire-extinguishing systems (a residential sprinkler system). The most recommended is the high-pressure mist technology, which was developed for the ship-building industry, and uses only 10 per cent of the amount of extinguishing water used by traditional sprinkler systems.

So far 40 wooden residential buildings more than two storeys high have been built in Finland with a total of 811 residences. Under construction are 400 apartments in wooden multi-storey buildings, and in 2015 there are plans to start the construction of about 1,500 new residences in wooden multi-storey buildings. At present more than 6,000 residences in multi-storey residential buildings in different parts of Finland are planned. Three wooden multi-storey office buildings have been built. Wooden school buildings are being built, and about ten are in the plan-



ning stages. Wooden day care centres and school buildings are becoming more common in the quest for a healthy and pleasant indoor climate.

Several construction methods exist for multi-storey wooden buildings

Numerous different frame systems exist for multi-storey construction with wood, and sufficient production facilities and manufacturing capacity for them exist in Finland. In addition to skeleton frame construction, level elements, and post and beam technology, the Cross Laminated

