Mjöstornet – The world's tallest timber building

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1. Background

In 2009 Moelven Töreboda, the Moelven Group's Swedish glulam producer launched a new wood based building system for tall timber buildings. The purpose of the launch was to provide the market with a more sustainable alternative to the traditional steel and concrete alternatives.

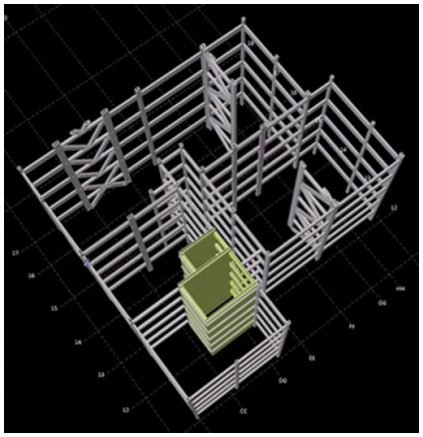
The system was named **Trä8** (translates into "wood eight") as a permanent reminder that it is a wood based system that handles eight metres span width.

With **Trä8** Moelven is able to offer a sustainable alternative for building structures that has typically only been able to build with post and beam systems with steel structures combined with concrete deckings or structures with prefabricated concrete elements.

Nowadays **Trä8** is to be seen as a name of our gathered methods and our preferred way of designing modern wood buildings. The system is open, flexible, wood based and very material efficient.

2. Technical description

Our way of designing the load bearing system as well as our production facility has been developed to offer great level of freedom to the architect. Span width as well as height offers a generous design window allowing really tall structures as well as interesting building layouts.



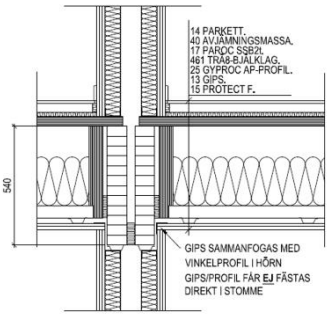
Technically the structures are normally built up with vertical posts taking the vertical loads parallel to the grain of the wood granting minimal deflection and deformation over time. The posts are connected together with glulam beams and steel connectors. The intermediate floor elements are made out of LVL-boards in combination with glulam beams. The post and beam structure is either stabilized with trusses in the outer or inner walls or with the help of the staircase / elevator shaft that can be made out of both wood and concrete. Combinations of both these solutions have often been proven to be the best solution. The decision for the specific solution for each individual building is always made with the aim of using as little material as possible but still providing good strength and comfort properties.

2.1. Light timber structures and stability

Trä8 is probably the lightest building system for tall timber buildings on the market. The low weight poses some challenges. First of all, the stability, or moreover the dynamic properties. Stiff trusses, sometimes in combination with a concrete staircase- /elevator shaft combined with concrete deckings on the top floors takes care of this. Off course a robust ground connection is also considered.

2.2. Light building structures and acoustics

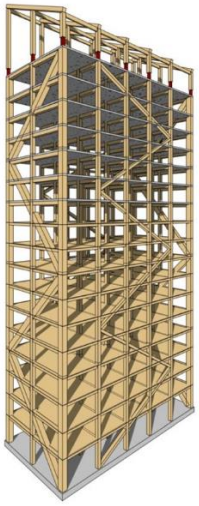
A timber building is by default a lighter construction than a concrete building. Sound is vibrations and in order master proper sound insulation in these light structures we need to control the vibrations that occur when for instance a person is walking across the floor. Our interpretation of a robust design for good sound insulation is again very much related to using as little material as possible. The trä8 floor elements is therefore carefully tested and fine-tuned for each individual building in order to achieve the best possible performance without using more material than absolutely necessary.



3. Trä8 in Mjöstornet

3.1. Dynamics

Over the years we have erected a number of multi-storey buildings and normally the building height has been between 4-8 storeys. Mjöstornet with its 81 meters and 18 storeys is however something completely different. The major difference between a "bread and butter" project is the size of all the individual glulam units but still the building technique is more or less the same. There is however one thing that separates the statical design from all other projects so far and that is the how the dynamic properties have been secured. A tall, slender and light building like Mjöstornet needs extra weight to achieve the required dynamic performance. Here we have used concrete deckings for the top seven storeys. This adds the extra weight to the already very stiff structure and makes sure the house behaves the way it is supposed even in heavy wind conditions.



3.2. Fire safety

The main structure of Mjöstornet is designed for R120 according to Eurokode NS-EN 1995-1-2. The building is equipped with sprinkler and all steel connectors are hidden within the glulam structure in order to be isolated from heat in case of fire.

Surfaces in escape routes are treated with flame protective opaque paint. In the design phase of the project some additional tests on full scale posts were conducted showing the superior properties of glulam in terms of fire safety. The tests showed how the pyrolysis effect works with the burnt surface creating an insulating and protective layer of burnt wood, protecting the unburnt core of the glulam element.