Mjøstårnet – Construction of an 81 m tall timber building

Rune Abrahamsen, CEO, Moelven Limtre AS
This is Moelven

- One of Scandinavia's largest wood-processing groups
- 3,500 employees in 50 business units in Norway, Sweden and Denmark
- Production facilities in Norway and Sweden
- 2016: Turnover of more than 1 billion Euros
- Three divisions: Timber, Wood and Building Systems
- Moelven Limtre is part of Building Systems
Moelven Limtre (Limtre = Glulam)

Established in 1959. 135 employees

Produces about 26 000 m³ per year in Norway and 35 000 m³ per year in Sweden. No CLT production!

Two factories in Norway. One in Sweden
Moelven projects

96 m roof span
Treet in Bergen

Completed 2015

51 m tall

Combination of glulam trusses, CLT staircases and prefabricated building modules
Mjøstårnet – where is it?

140 km and 90 mins drive north of Oslo

60 mins drive north of OSL Airport
Location – Brumunddal

Located next to highway E6 and Mjøsa – Norway’s largest lake (120 km)
Building owner: AB Invest AS. Arthur and Anders Buchardt.

- The Norwegian contractor HENT builds Mjøstårnet for AB Invest as a turnkey contract
- Moelven Limtre is HENT’s sub-contractor for structural timber components
The initiative to build Mjøstårnet comes from Arthur Buchardt. His vision is that the project will be a symbol of the green shift, and a proof that tall buildings can be built using local resources, local suppliers and sustainable wooden materials.
Video about the Mjøstårnet project
From sketch to reality

February 2015: Arthur Buchardt’s sketch

October 2017: Moelven Limtre AS
Companies involved in timber construction

Main contractor: HENT

Project architects: VOll

Engineering: SWECO

Timber structures: MOELVEN

CLT subcontractor: WOODCON, StoraEnso

LVL in timber floors: MetsäWood

Prefabricted elements: RVT

Cladding: WOODIFY

Project support: INNOVATION NORWAY
Trä8 building system
Trä8 building system – optimized material use

Use material only where you need it!
The structure at a glance

- 30 m taller than Treet in Bergen, similar glulam structure but without building modules
- Glulam columns, beams and diagonals
- CLT shafts for elevators and stairs
- Wooden prefabricated façade elements make up the building envelope
- Wooden slabs in the first ten floors. MoelvenTrä8-elements
- Concrete decks in the upper floors for apartments
- 2600 m³ timber structures
More info from structural design

- Timber engineering done by Sweco for Moelven Limtre
- Calculated using the software Robot
- Glulam is the primary load bearing for all vertical and horizontal loads
- CLT is used for secondary load bearing of staircases and elevator shafts, and is not structurally connected to the glulam
- 140 mm max horizontal deflection (Level 18)
More info from structural design

Peak accelerations according to ISO 10137. The Red dots are for level 17 and the blue dots are for level 18.

We are on the limit on level 17, and slightly above on level 18. The client builds top apartment well aware of this.
Floor elements in Mjøstårnet

Prefabricated wooden slabs in the first ten floors. MoelvenTrä8-elements: Combination of glulam and LVL

The weight from the concrete decks in the six upper floors is needed to handle comfort criteria and acoustics.

Spanwidth: 7,5 m
R90 fire resistance
Production of glulam components

Production of truss diagonals

Block gluing of columns

Corner column size:
1485 mm x 625 mm
Webcam, videos, project info and more at www.moelven.com/mjostarnet
Assembly of timber structures

- Installation of timber structures started September 2017
- The building will be topped out May 2018
- Completed March 2019. People can move in

Timber skeleton: Almost one floor per week!
Installation of timber structures
CLT shafts
Installation of glulam structures
Preassembled frames. September 4
Installation of glulam structures
Status 18 september

Corner columns:

Max compression: 11500 kN

Max tension: 5500 kN
Installation of glulam structures
Status 18 September
Installation of glulam structures
Status September 18
Installation of glulam structures
Status October 26

Corner column size:
1485 mm x 625 mm

Typical internal columns:
725 mm x 810 mm
625 mm x 625 mm
Installation of glulam structures
Status November 8
Prefabricated facade elements

Panel size 50-60 m².

Produced in a factory close to the building site
Installation of glulam structures
Status December 4
Installation of glulam structures
Status December 4
Installation of glulam structures
Status December 4
Installation of glulam structures
Status December 4
Installation of glulam structures
Status December 4
Fire protection of connections

R120 & Burnout

2.5mm intumescent strip - Intumex L. Expands 20 times at 150 degrees Celsius
The temperature in the column centre after 90 minutes of fire

Temperature in the test oven

Cross-section
405 mm x 460 mm
There is a race going on!


Tall Timber: A global audit

Tall Wood Gallery

- Brock Commons Tallwood House, Vancouver, Canada (18 Stories, 2017)
- Origine Condos, Quebec City, Canada (13 Stories, 2017)
- T3, Minnesota, United States (7 Stories, 2016)
- Arbora, Montréal, Canada (8 Stories, 2016)
- Moholt 50/50, Trondheim, Norway (9 Stories, 2016)
- Puukuokka, Väskylä, Finland (8 Stories, 2015)
- TREET, Bergen, Norway (14 Stories, 2015)
- Strandparken, Stockholm, Sweden (8 Stories, 2014)

Tall Timber: A global audit


CTBUH – Definition of timber buildings

The council for tall buildings and urban habitat had their international conference in Sydney in October 2017. A proposal was put forward to categorize different construction approaches to tall timber buildings. A single-material tall building is defined as one where the main vertical and lateral structural elements and floor systems are constructed from a single material. If a tall building is of steel or timber construction with a floor system of concrete planks or slab supported on steel or timber beams, it is considered a steel or timber building.
A composite tall building utilizes a combination of materials acting compositely in the main structural elements, thus including an otherwise steel or timber building with a concrete core.

This proposal has been put forward to the CTBUH Height and Data Committee for consideration.

Based on this we believe that Mjøstårnet is likely to be the world’s tallest timber building upon completion.
Experiences and thoughts on tall timber

- Glulam is well suited for high rise buildings. The large cross sections can handle fire requirements.
- Due to maintenance one should not expose timber main load bearing to weather.
- Cost of structure is cost competitive.
- Assembly is quick – everything prefabricated.
- CO₂ footprint is considerably lowered.
- Excess use of materials should be avoided, also when it comes to wood materials.
- Using only the materials you need and combining wood, steel and concrete will result in “climate smart buildings”.
Picture taken yesterday

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