

WCTE 2023

Large Glulam Structures in Norway

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Large glulam structures in Norway

→ From 1959 to 1989:

Ordinary production and products.

Example: Typical sporting hall from 1970



→ Juan Antonio Samaranch:

“The decision is Lillehammer”

The decision was that Lillehammer should host the 17th Olympic Winter games in 1994

For the Olympics:

→ Several halls with free span up to 100 metres have to be built

→ **Our goal:**

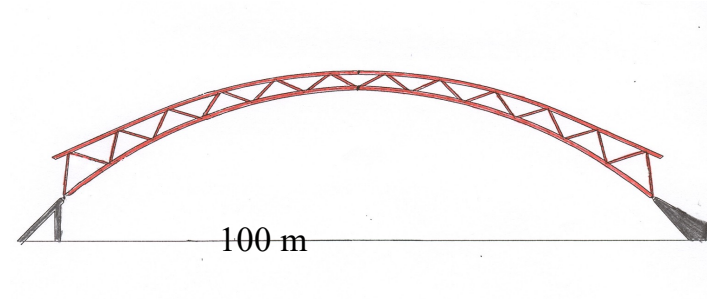
Minimum one of the large halls had to be built with loadbearing structures in laminated timber.

HOW ?

The Olympic stadiums

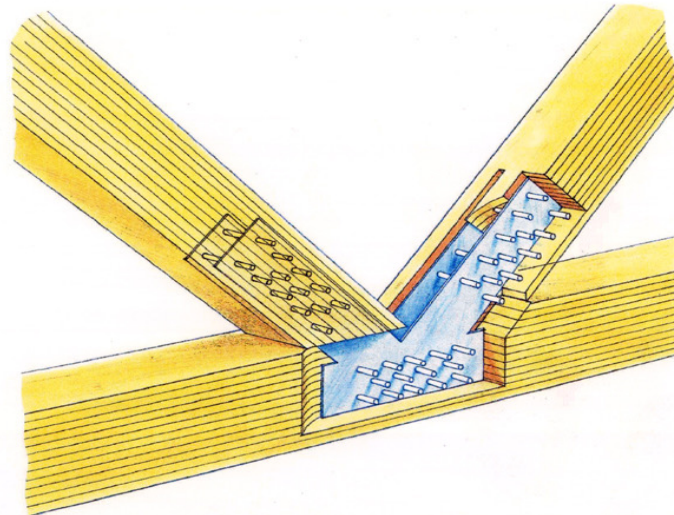
→ The solution:

- Arches
- Trusses
- Slotted in steel plates
- Dowels

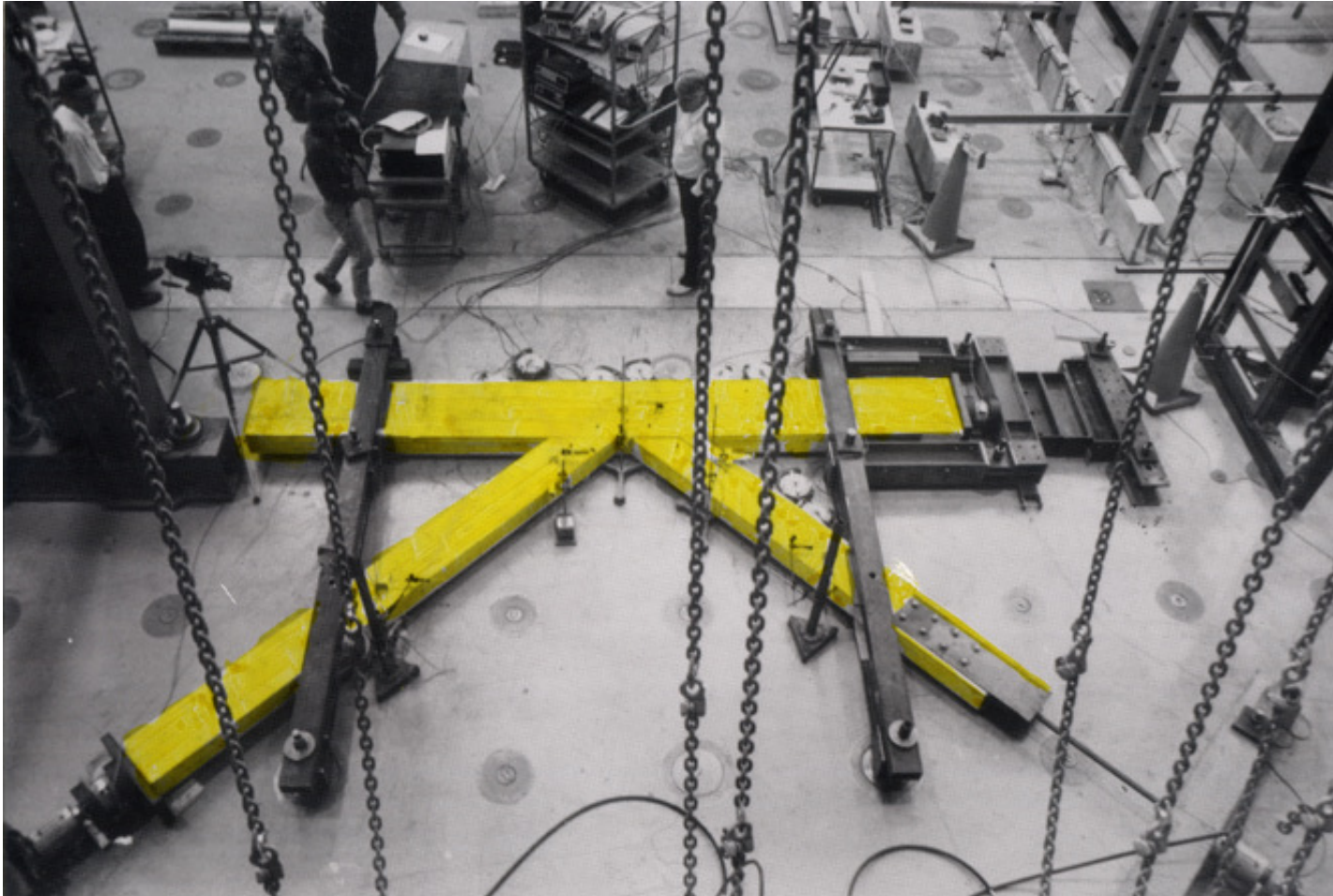


→ Old systems, but new combinations:

- Thickness of steel plates
- Dowel dimensions
- Steel quality
- Wood thickness



The Olympic Stadiums



Test of
dowel
connection

Olympic stadiums

Hamar Olympic Hall "The Viking ship"

- Maximum span: 96.4 m
- Length: 260 m



Architects:

- Niels Torp / Biong Architects.



Olympic stadiums

Håkons Hall

- Maximum span: 85,8 m
- Length: 127 m

Architects:

- Østgård arkitekter AS



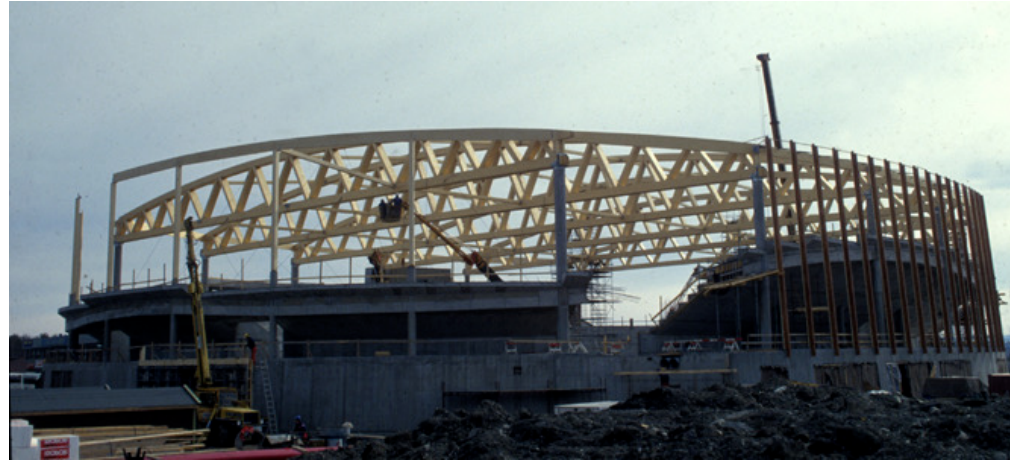
Olympic stadiums

Hamar Olympic Amphitheatre

- Maximum span: 70,8 m
- Length: 95 m

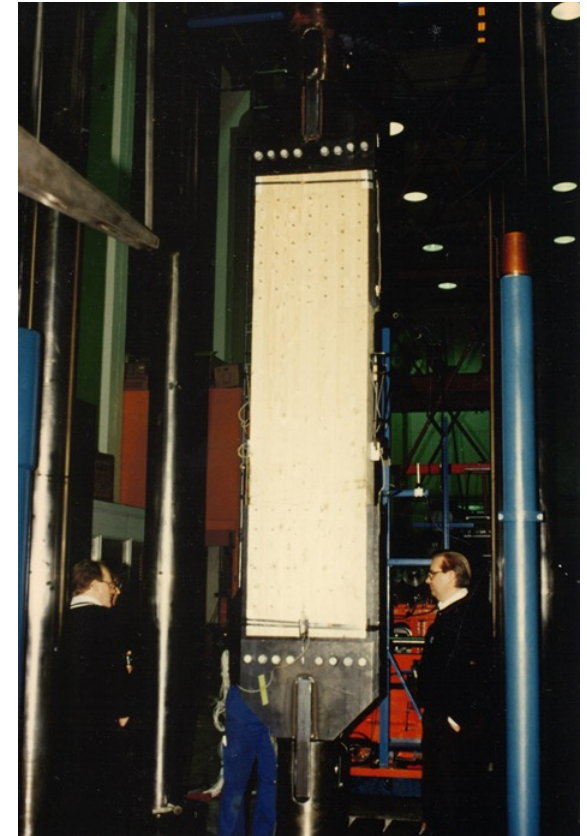
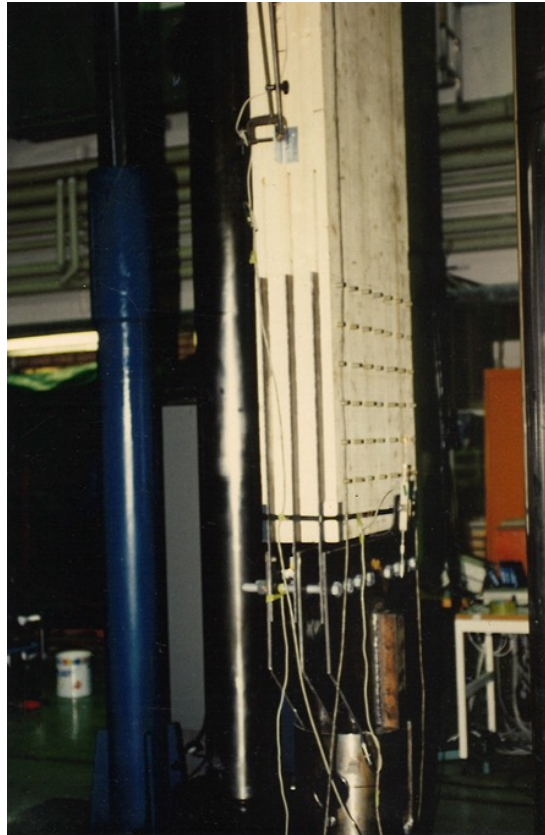
Architects:

- HRTB, Hovde ArkitekterAS



Olympic stadiums

Test of joint with an ultimate design tension load of 7 000 kN



Football Halls

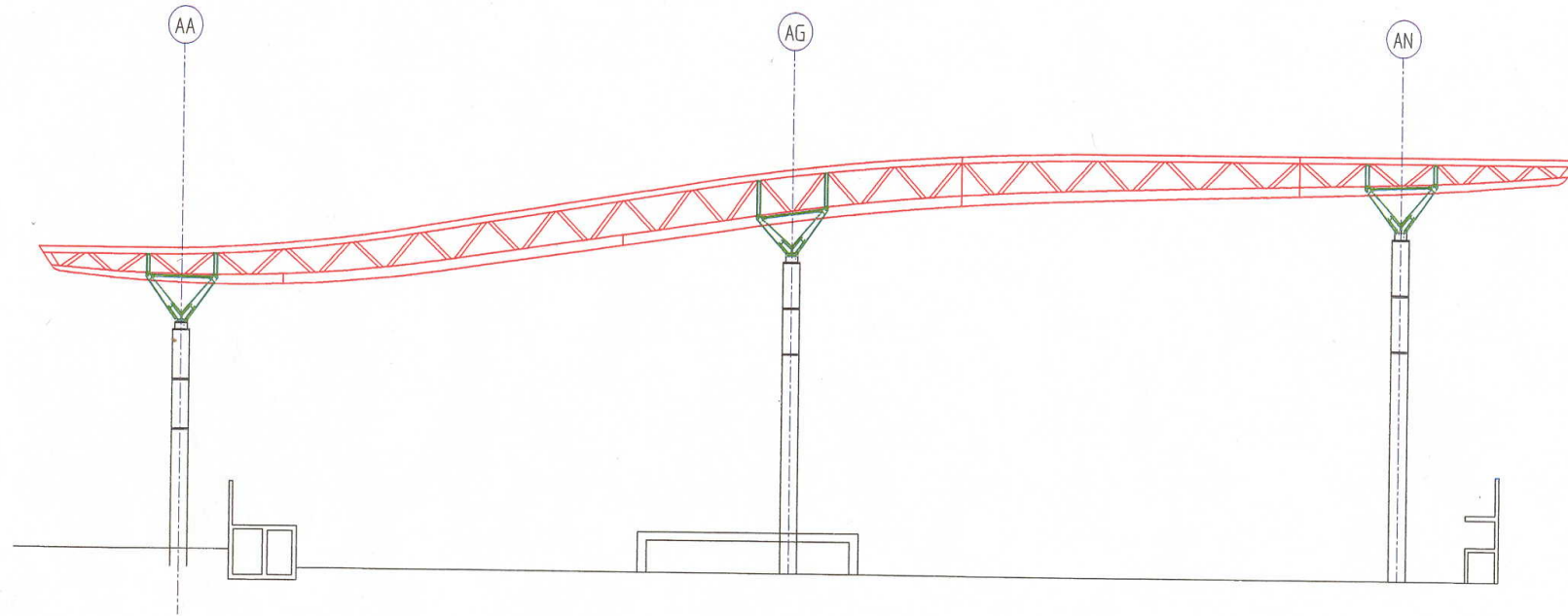


Sørlandshallen,
Kristiansand

Architects:
Biong Architects.

Span: 81 metres
Length: 112 metres

Oslo Airport Gardermoen



- Total lengde 136 m

Architects:
Aviaplan AS

Oslo Airport Gardermoen

- Free span 2 x 54 metres
- Total length 136 metres
- Architects: Aviaplan AS



Oslo Airport Gardermoen



Oslo Airport Gardermoen



The Nordic Timber Bridge Project

- The objective was to increase the competitive power of timber in bridges compared to other structural materials
- The project was running in the period 1994 – 2001
- **Participation: Finland, Sweden, Denmark and Norway
Industry, Research Institute., University and Road authorities**



Evenstad Bridge



Total length	180 m
Carriageway width	6.5 m
Span length	36 m
Construction year	1996



Tynset Bridge



Total length	125 m
Max. span	70 m
Horizontal clearance	7 + 3 m
Construction year	2001

Flisa Bridge



Bridges

- Flisa bridge (2003)
- Free span 70 metres
- Total length 197 metres.
- Plan Architects AS



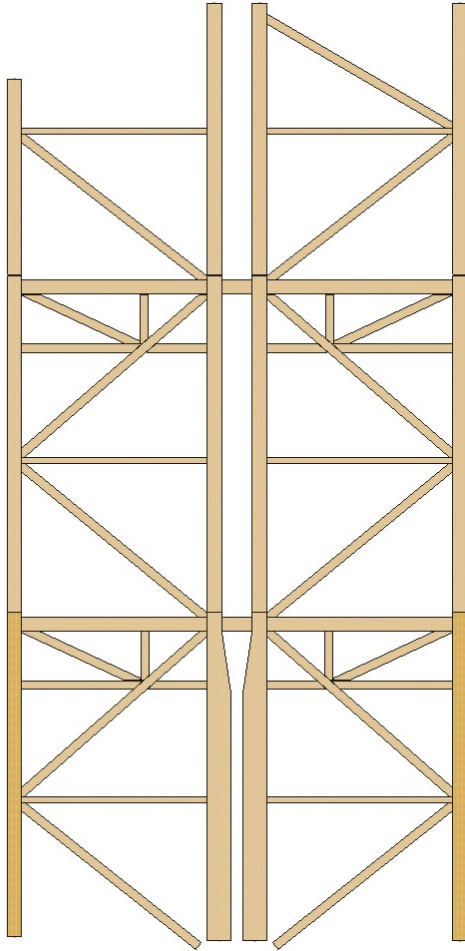
Flisa Bridge



"TREET" - the world's tallest timber building in 2015

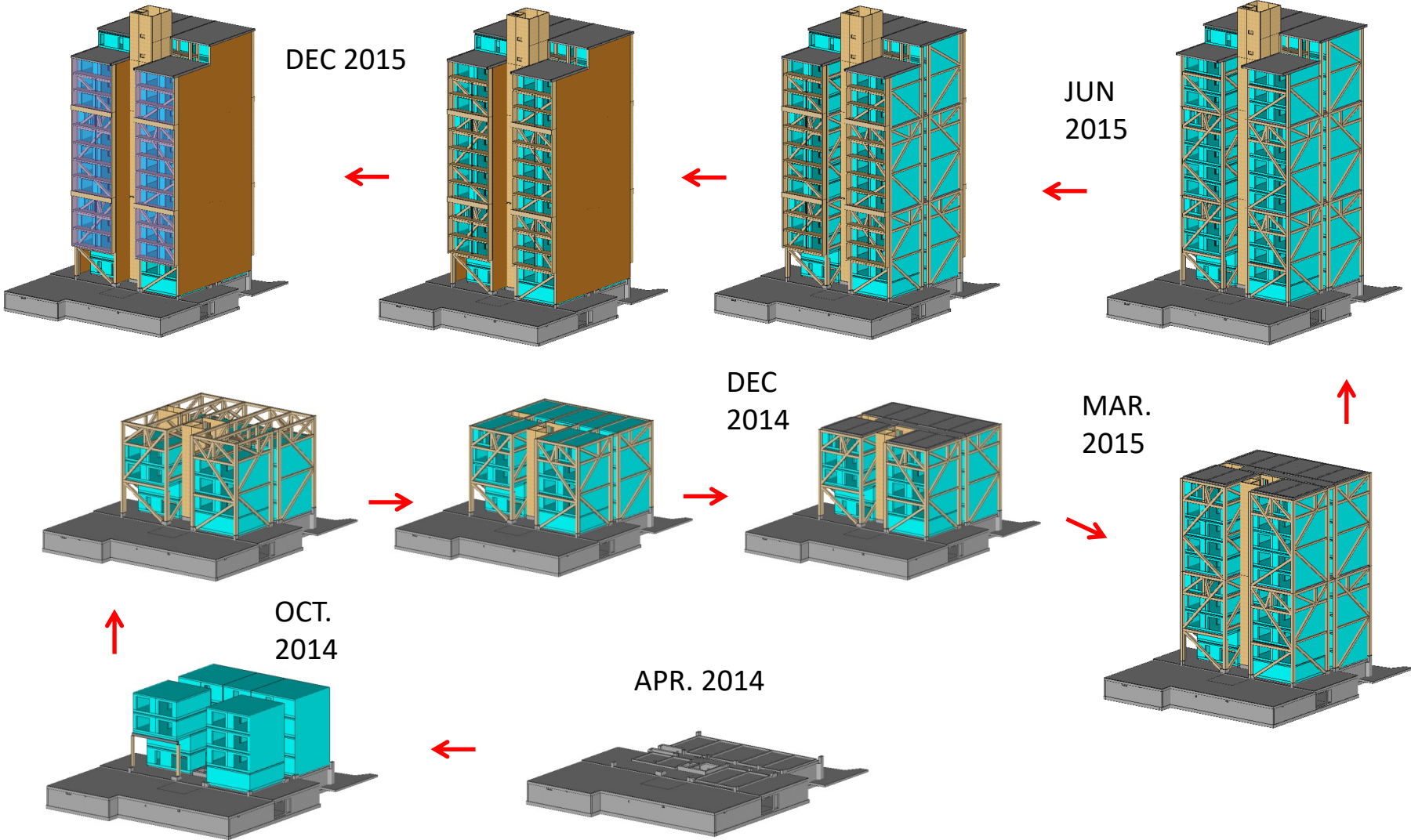


Assembling trusses in a factory



- **Trusses are completely finished in the factory**
- **Size: 10x45m**
- **The entire geometry is laid out precisely in the factory**
- **All parts are finished cut and adapted to each other and all holes are drilled**
- **Geometry can then be reproduced exactly on the construction site**
- **A total of 16 truss axes was produced before start installation**

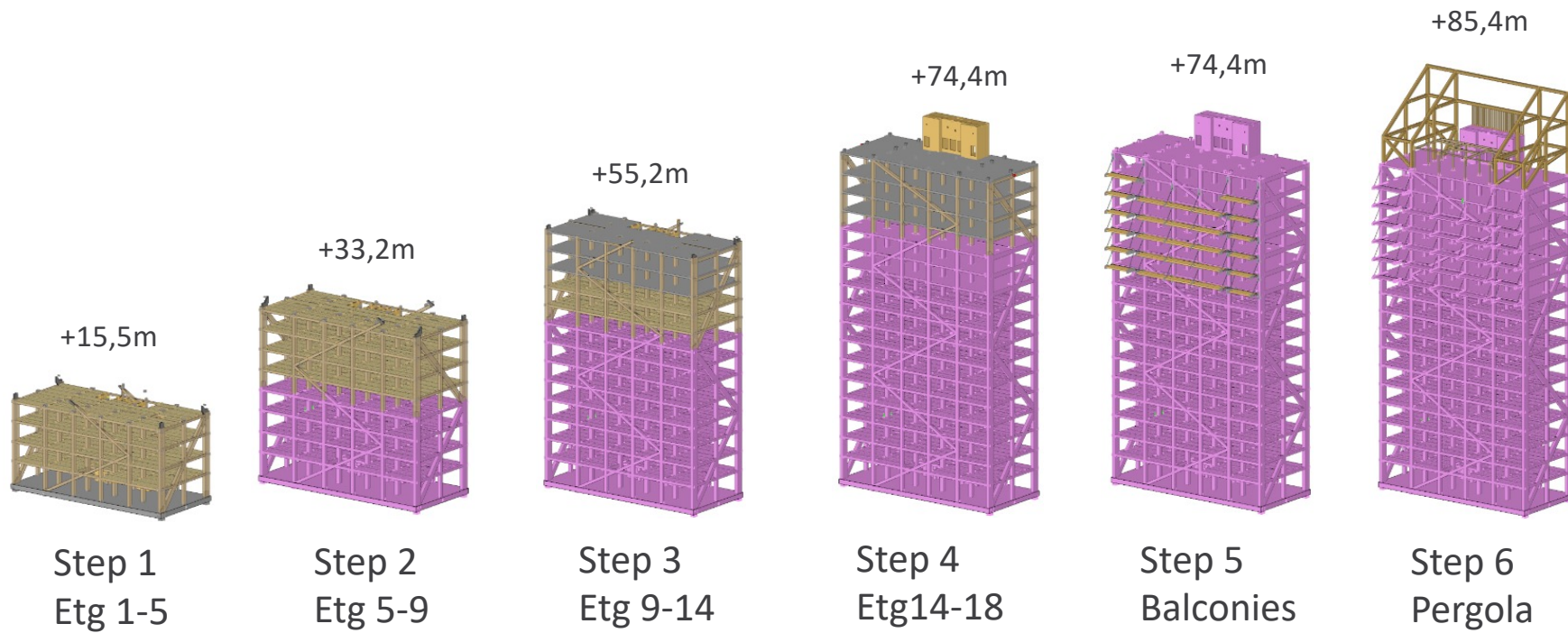
ASSEMBLY PHASES





Mjøstårnet –

**the world's tallest
timber building in
Brumunddal when
completed in 2019**



Assembly steps

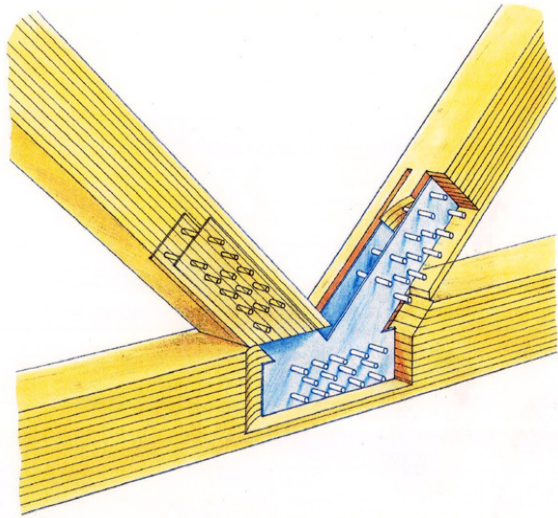
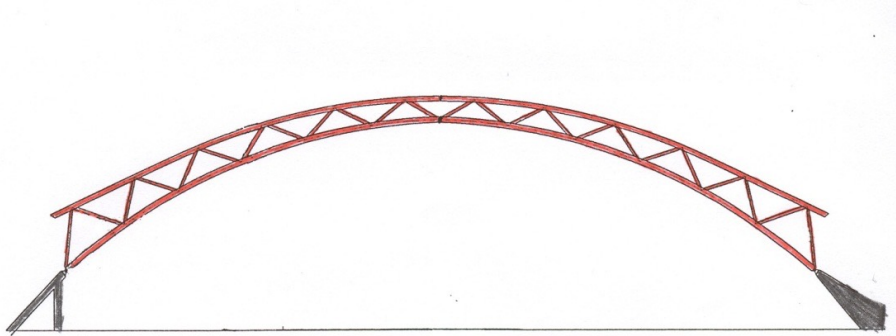


Assembly start september 2017



Mars 2018

Large glulam structures in Norway



Thank you for listening