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Timber connections

Dr. Tomas Gečys

Vilnius Gediminas Technical University

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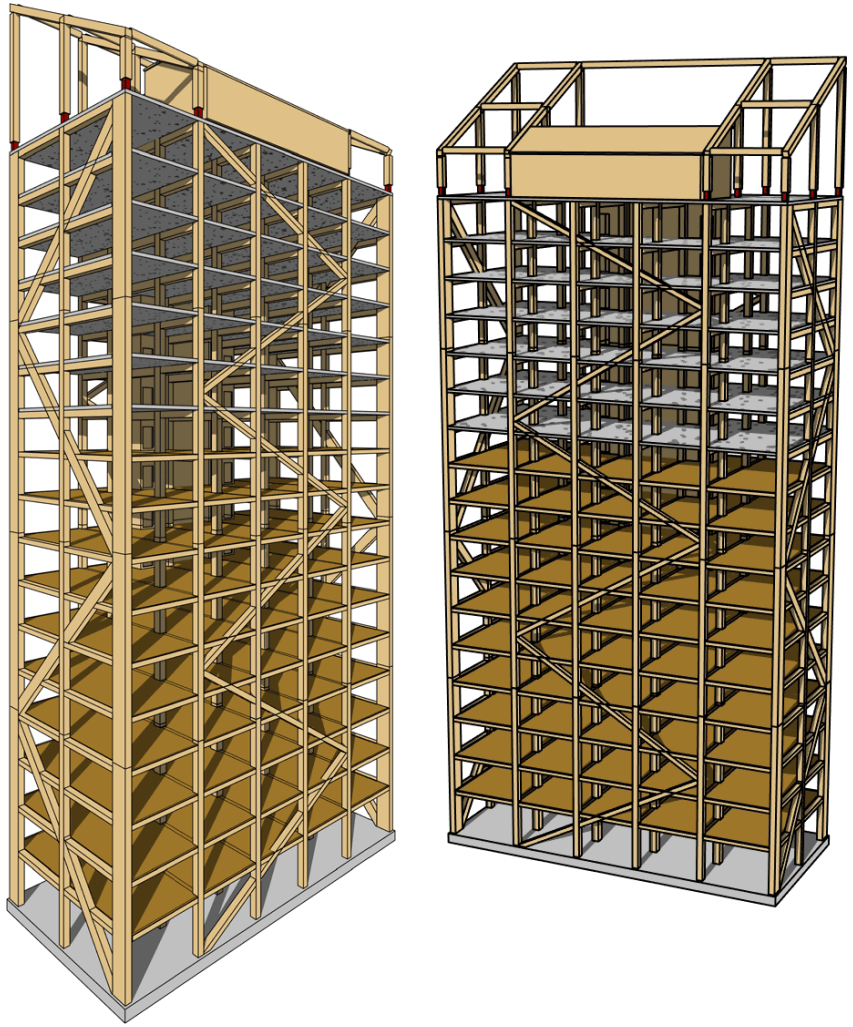

Mjosta tower in Norway (source: Forum HolzBau Garmisch 17)

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Mjosta tower in Norway (source: Forum HolzBau Garmisch 17)

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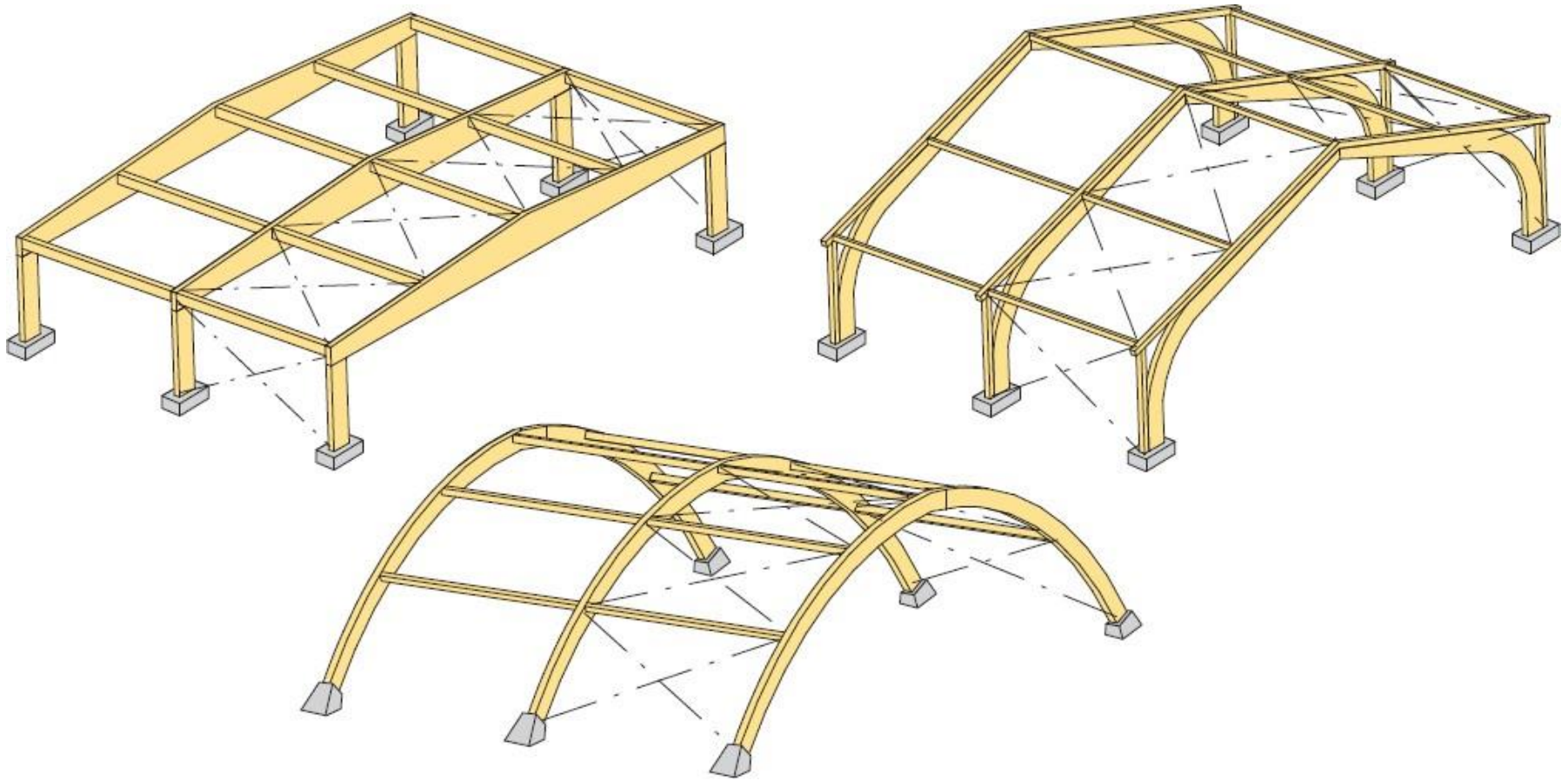
Structural systems of timber frames (1)



Design of timber structures Volume 1: Structural aspects of timber construction (Swedish Wood, 2016)

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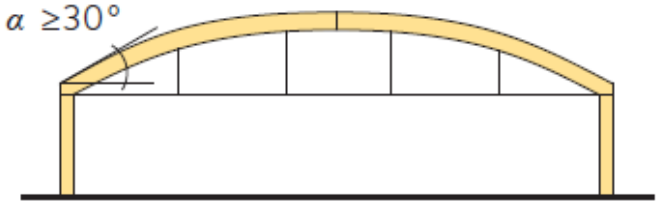
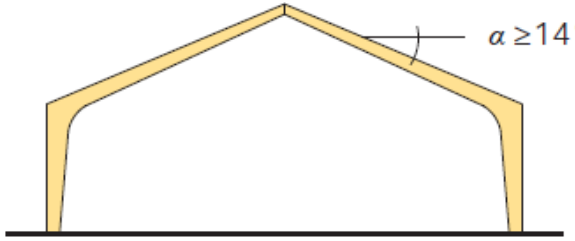
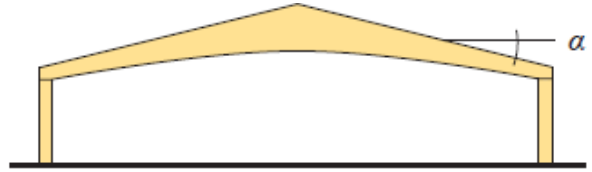
Structural systems of timber frames (2)



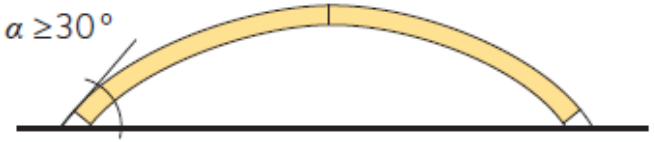
Two or three-hinged tied arch



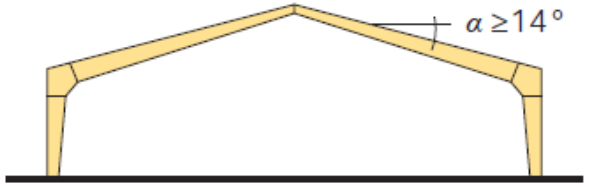
Three-hinged portal frame with curved haunches



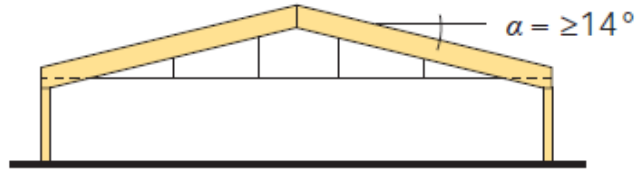
Double pitched beam with curved underside



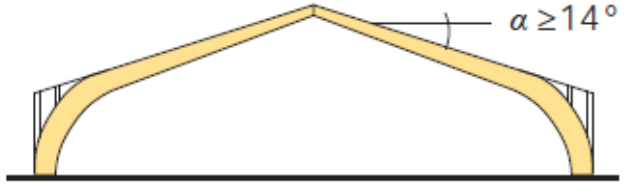
Two or three-hinged arch

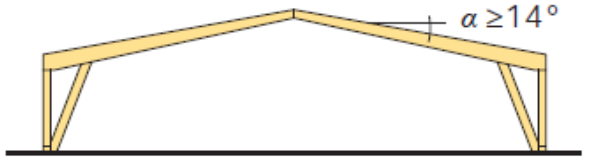


Three-hinged portal frame with finger-jointed haunches

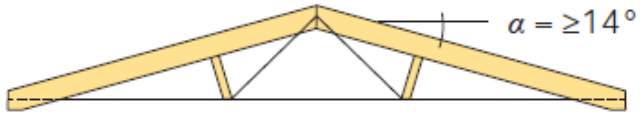


Three-hinged tied rafter





Three-hinged portal frame with knee bracing



Three-hinged tied trussed rafter

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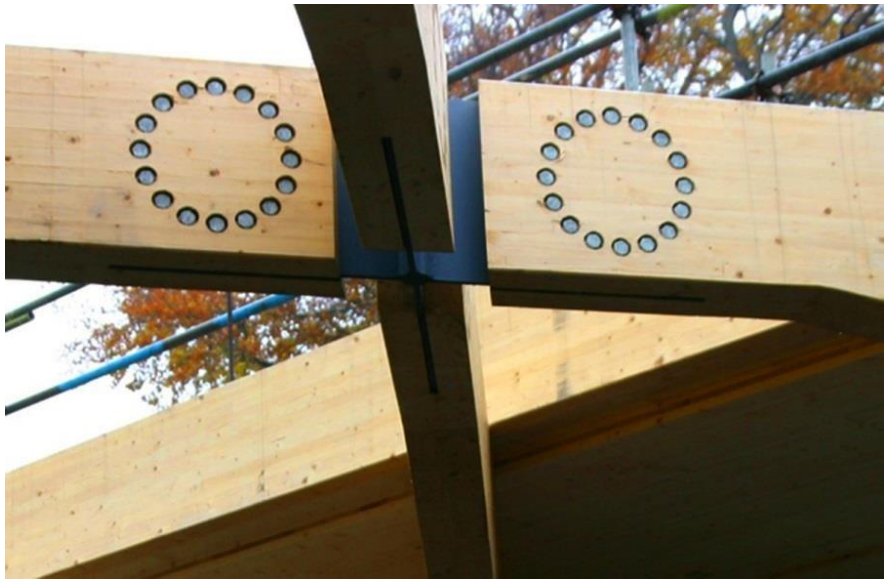
Connections using dowels/bolts



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Connections using dowels/bolts

Advantages of traditional dowel/bolt types connections:

1. Easy and fast installation;
2. Easy to control the assembling process;
3. Elastic-plastic behavior of the connection.

Disadvantages of traditional dowel/bolt types connections:

1. Initial slip of the connection due to the tolerances of production;
2. Fire performance if the steel details are not exposed.

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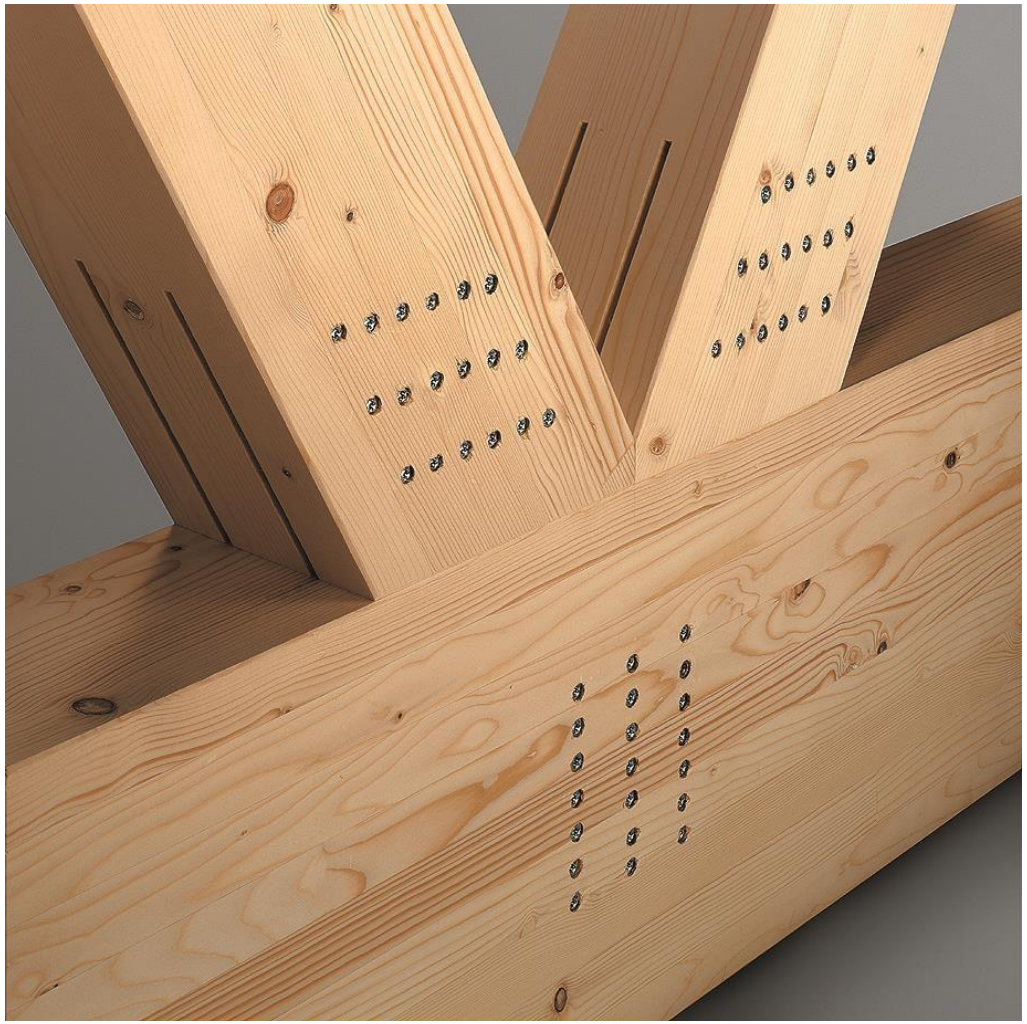
Connections using self-tapping dowels



Source: SFS Intec AB (left) and Rothoblaas (right)

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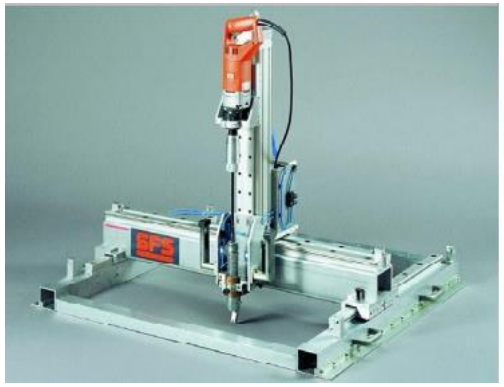

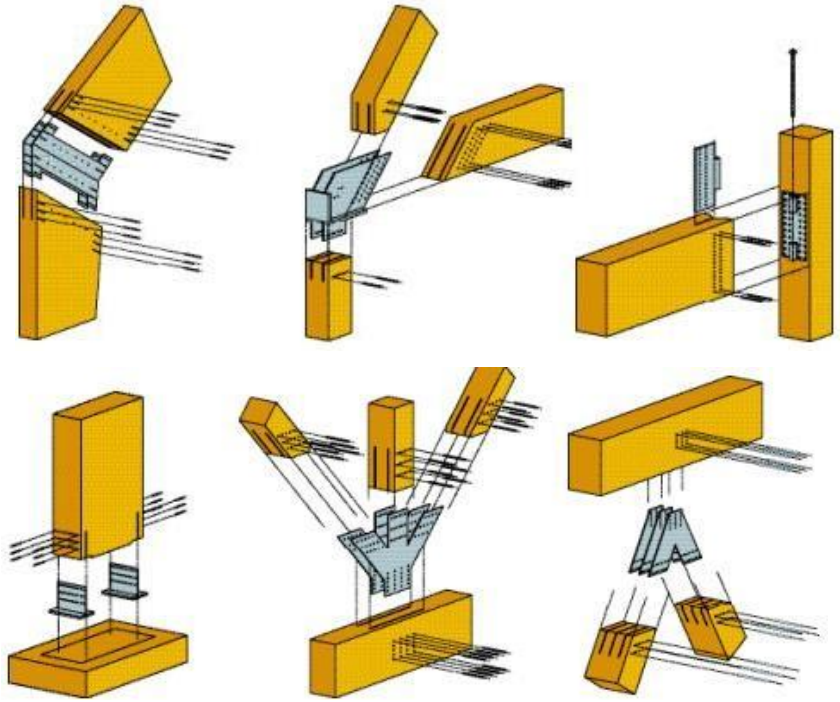

Source: SFS Intec AB

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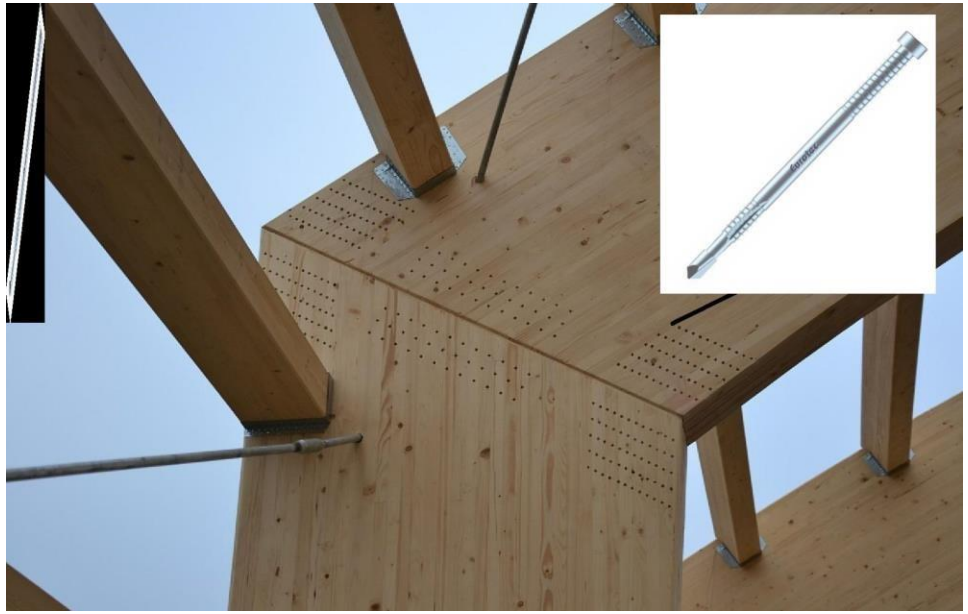
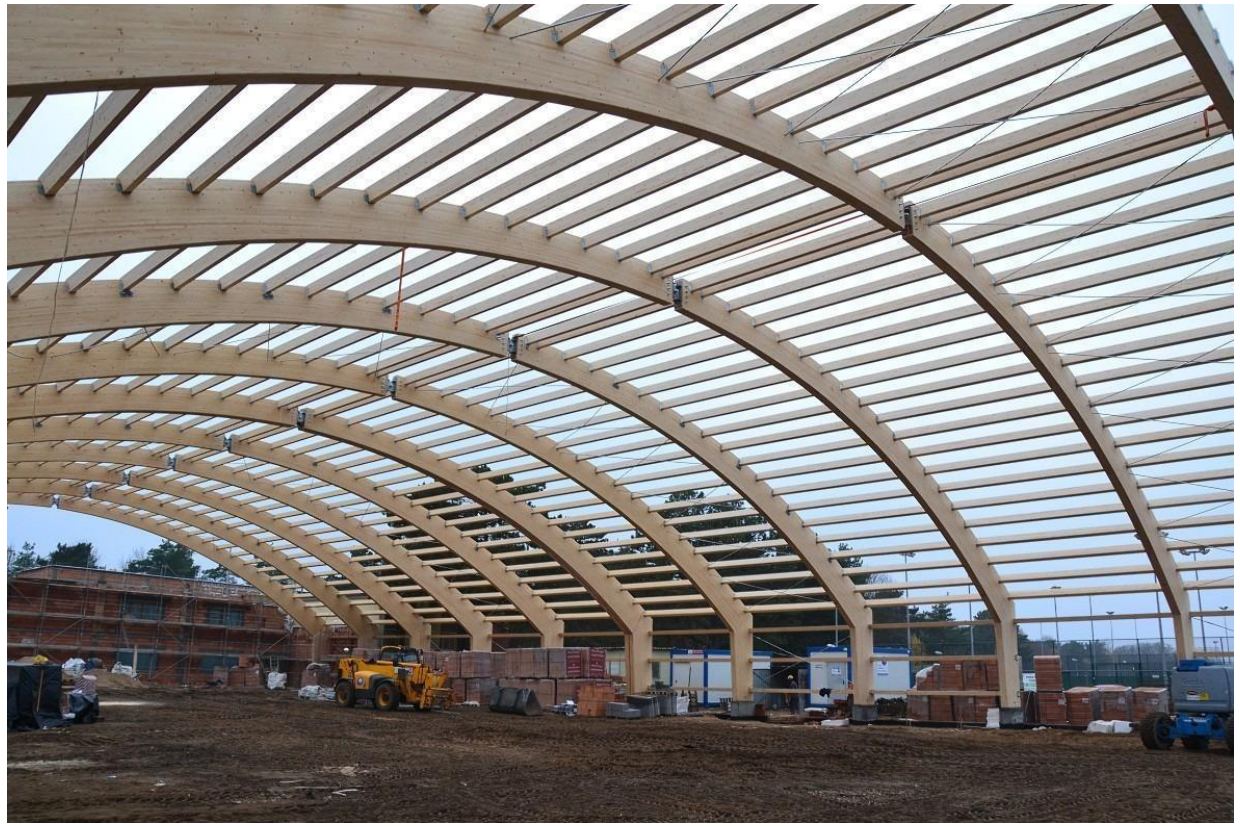
Connections using self-tapping dowels





Source: EuroTec

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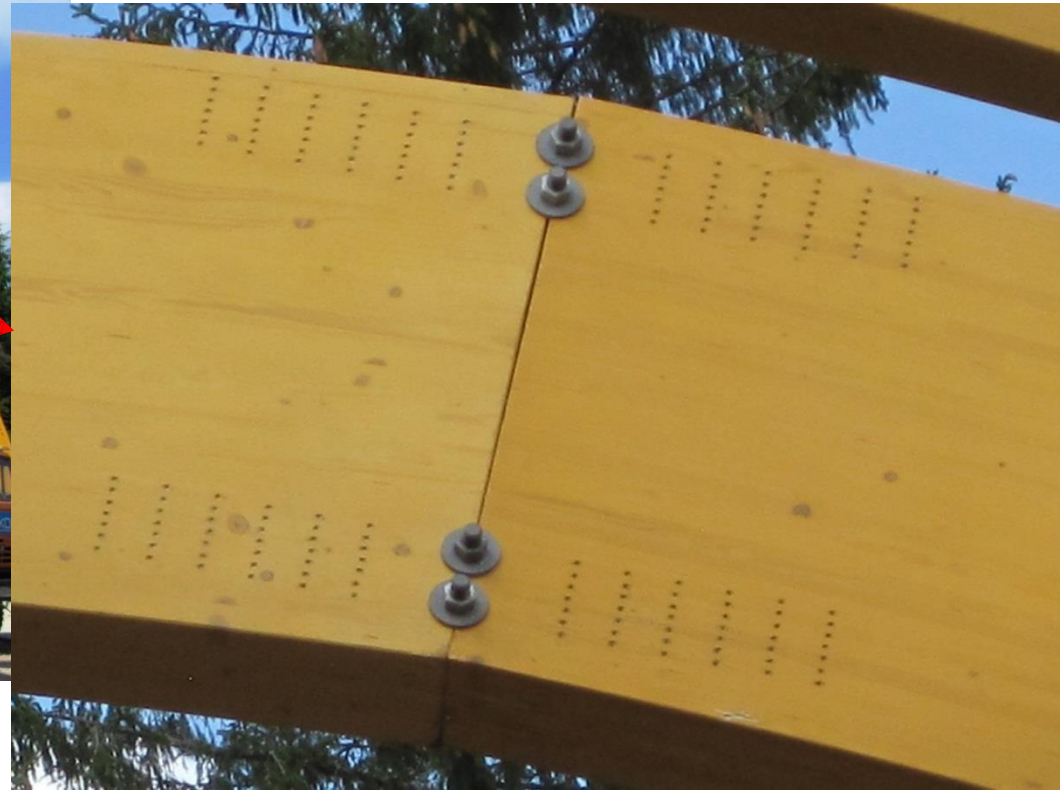
Connections using self-tapping dowels



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Connections using self-tapping dowels

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Connections using self-tapping dowels

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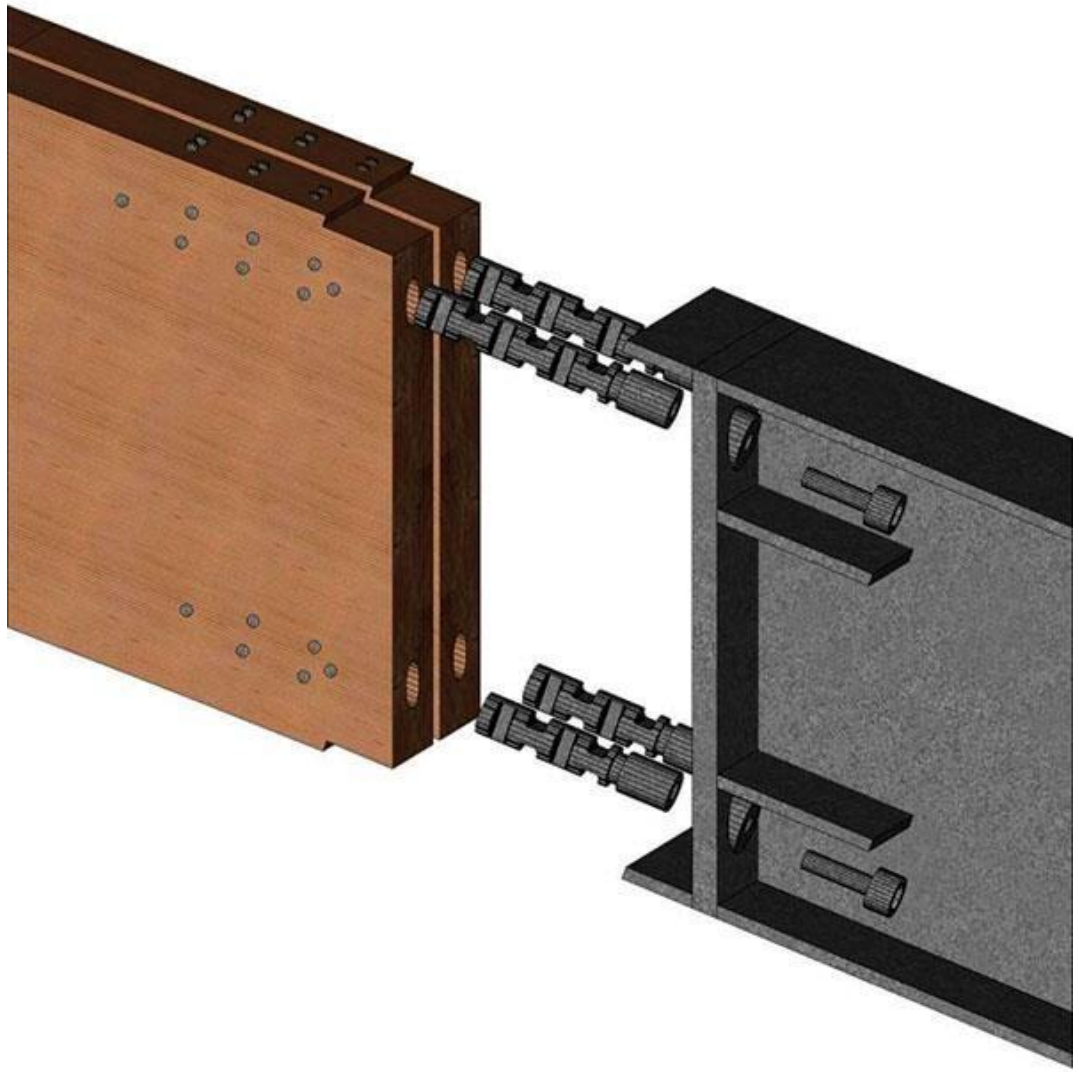
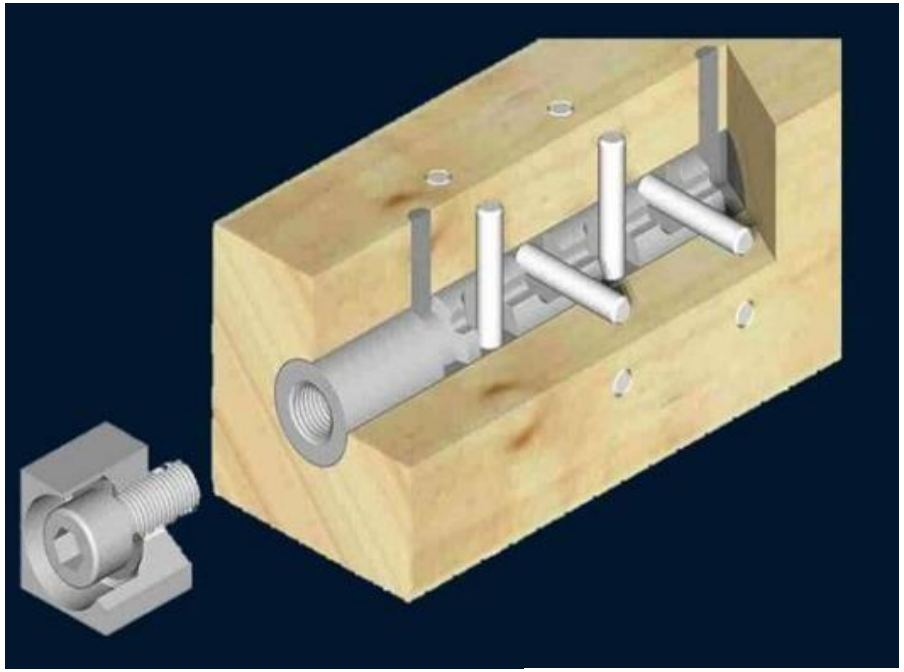
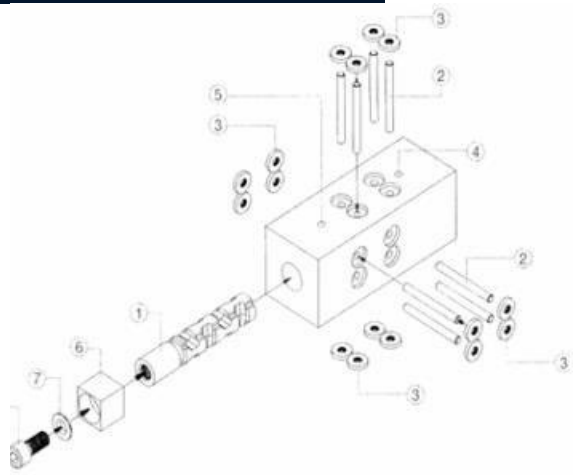
Connections using Large diameter steel detail anchored with dowels (Bertschie system)







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Connections using Large diameter steel detail anchored with dowels (Bertschie system)

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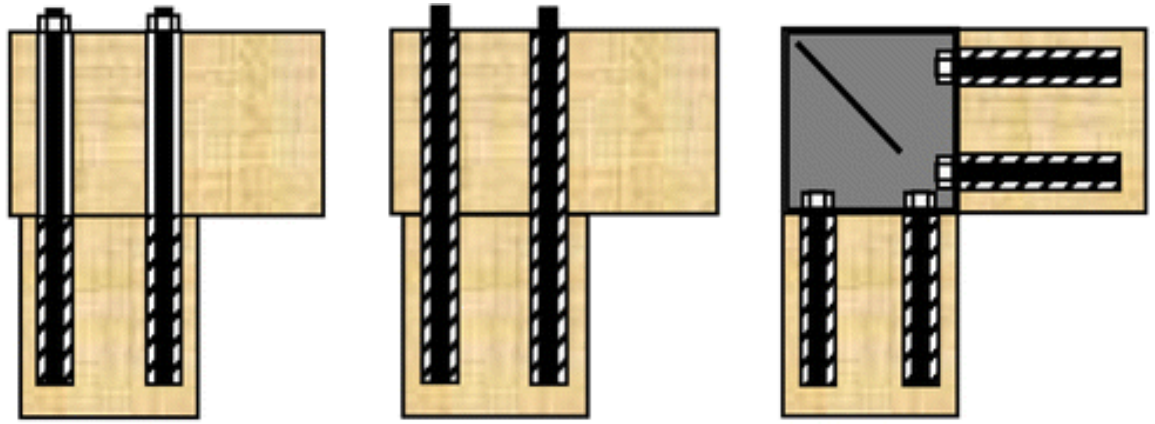
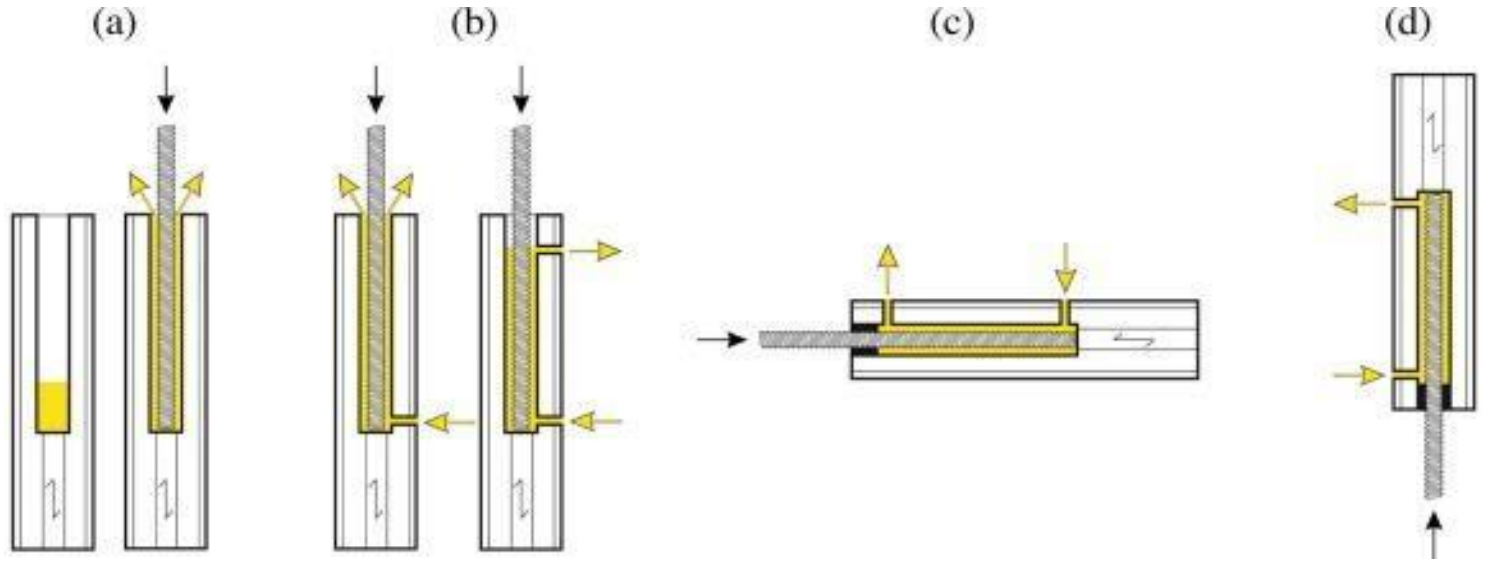
Connections using Glued-in steel rods



Configuration A Configuration B Configuration C



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Connections using Glued-in steel rods

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Connections using Glued-in steel rods

Advantages of glued-in steel rods in timber:

1. High stiffness of the connection up to failure;
2. The connection fully installed at the factory;
3. Steel elements may be fully hidden in the timber elements;
4. Elastic-plastic behavior may be reached by gluing the rods at an angle of 45 degrees.

Disadvantages of glued-in steel rods in timber:

1. Connections are sensitive to the moisture content change;
2. The installation process is hard to control.

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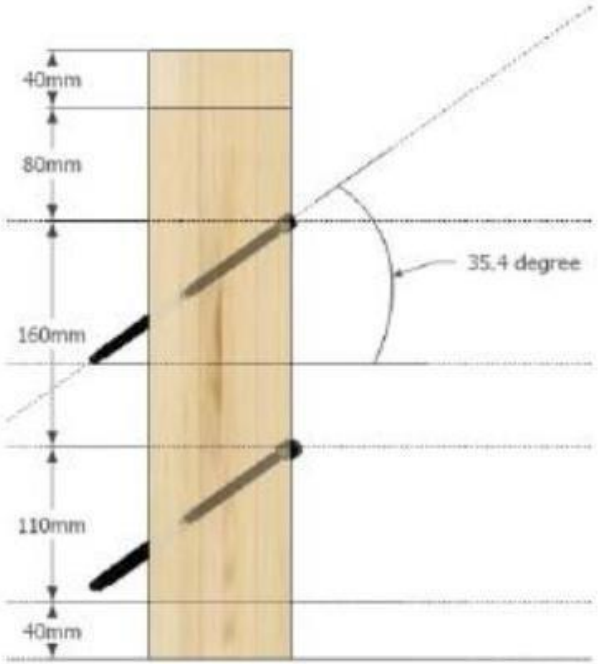
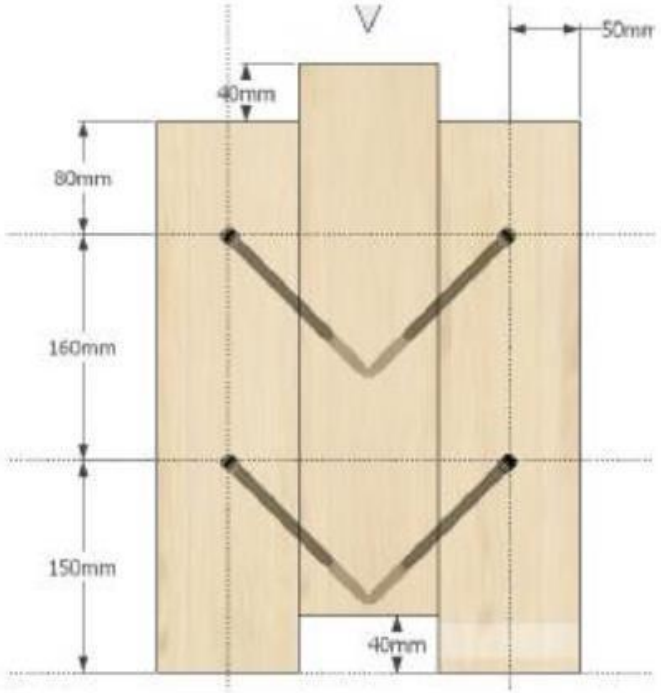
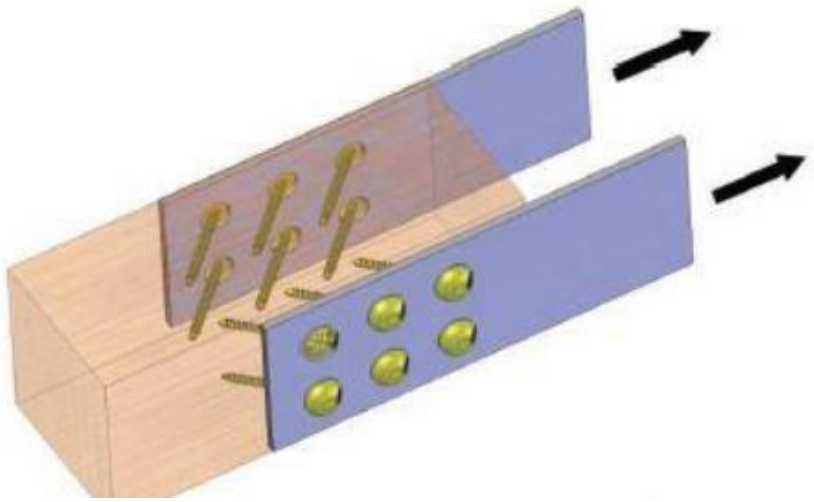
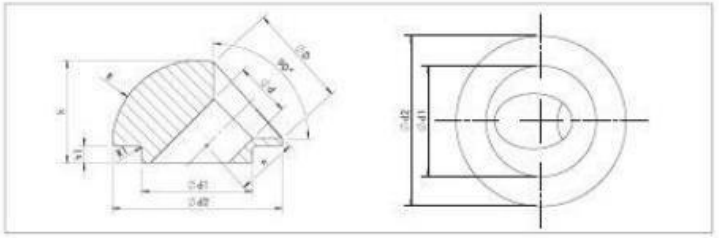
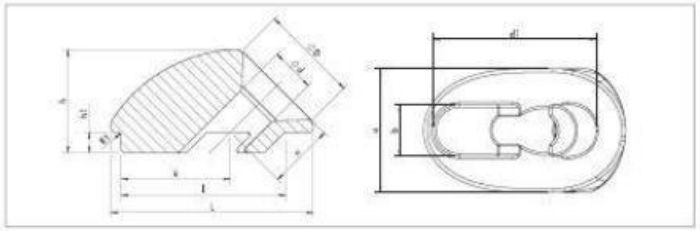
Connections using Screws installed at an angle of 45 degrees











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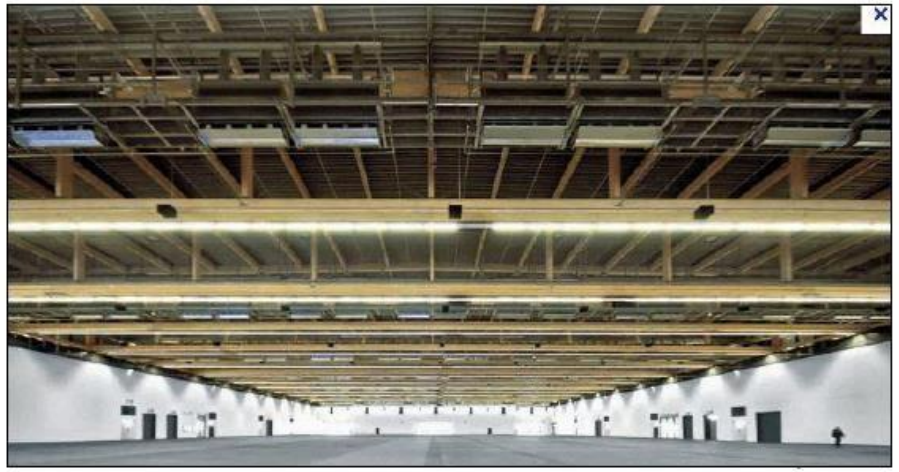
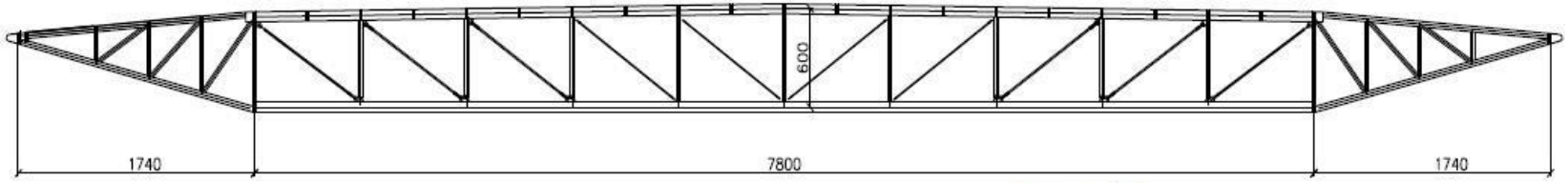
Connections using Screws installed at an angle of 45 degrees



30m high
77m free span + 12m cantilevers
12 x 115m long truss, 6.7m high
2,600 m³ glulam beams



Source: Wiehag

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Connections using Screws installed at an angle of 45 degrees

Photo: Atlas Copco

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Connections using Screws installed at an angle of 45 degrees

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Connections using Screws installed at an angle of 45 degrees

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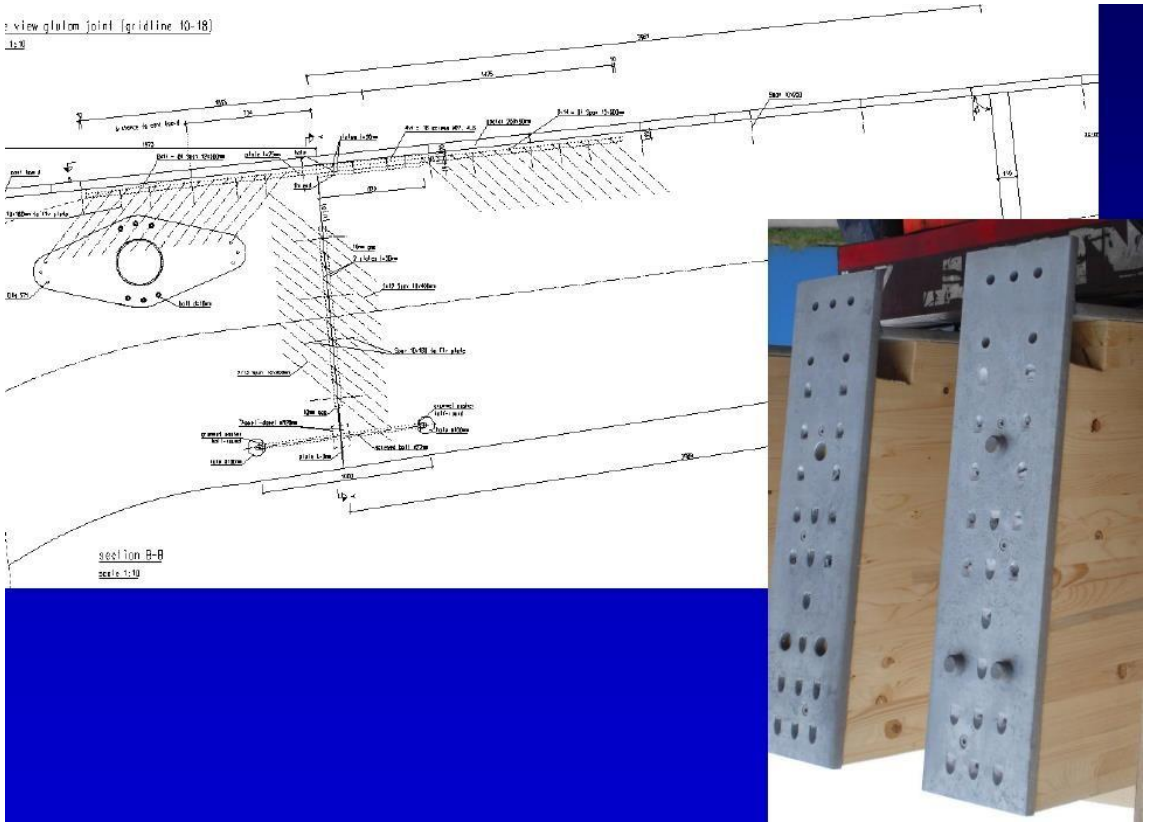
Connections using Screws installed at an angle of 45 degrees

Sunderland Aquatic Center



Moment resisting connection

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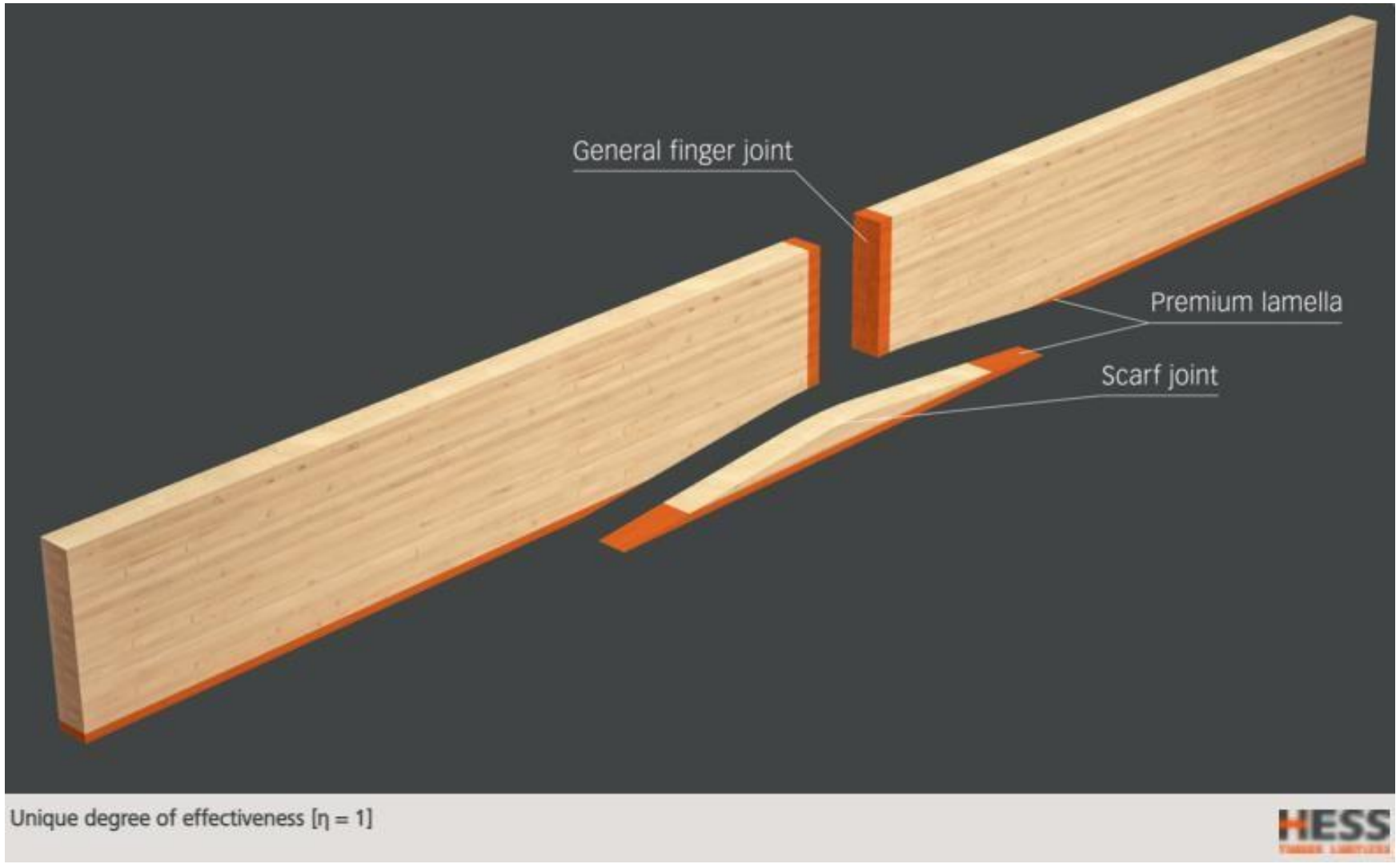
Connections installed by Gluing structural elements on a construction site



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Connections installed by Gluing structural elements on a construction site

Source: Hess Timber Limitless

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Thank you for your attention!