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From wood to wonders.













## **Recall: Kick-off meeting in Helsinki**



#### Joints



#### **Primary purpose**

Foster high-performance hardwood structures by developing economic, reliable and innovative joint technologies for hardwood members and the design thereof.

#### HOW?

UNDERSTAND – COMPLETE – OPTIMISE – IMPLEMENT

#### KICK-OFF: UNDERSTAND...

Contributions to load-carrying capacity of joints



## Rope effect in dowelled joints



## Opened specimen after test



## Beech LVL with cross layers

Load-displacement curve



### KICK-OFF:... COMPLETE...

## Groups of axially loaded screws





## Results

		α = 0º end-grain joint	α = 45º tension lap joint	α = 90º loading perpto-grain
et failure mode η requirements	beech & birch	Withdrawal, <i>n</i> <sub>ef</sub> ~ n <i>a</i> <sub>2</sub> ≥ 3 <i>d</i> , <i>l</i> <sub>emb</sub> ≥ 10 <i>d</i>	withdrawal a <sub>1</sub> ≥ 5 <i>d</i> , a <sub>1,CG</sub> ≥ 5 <i>d</i>	withdrawal, $n_{ef} \sim n$ $a_1 \geq 7d$ , $a_2 \geq 5d$ (EC5) $a_1, a_2, a_{2,CG}$ acc. ETAs if $l_{emb} \geq 4d$ block or row shear, $n_{ef} < n$ $a_1, a_2, a_{2,CG}$ acc. ETAs steel failure, $n_{ef} \sim n$ $a_1, a_2, a_{2,CG}$ acc. ETAs
tar wi	beech LVL	withdrawal $a_{2,tan} \ge 3d$ , $a_{2,rad} \ge 4d$ , $I_{emb} \ge 11d$	-	block shear, $n_{ef} << n$ $a_1, a_2, a_{2,CG}$ acc. EC5 withdrawal, $n_{ef} \sim n$ $a_1 \times a_2 \ge 10d \times 10d$

### KICK-OFF: ...OPTIMISE...

#### Increase stiffness and capacity



## Increase stiffness and capacity – Rough shear planes







# Milestone 2 🗸

KICK-OFF: ...OPTIMISE...

#### BOF (nonlinear beam-on-foundation) modelling



## BOF – Example: Modelling of rope effect









## Thank you!

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![](_page_16_Picture_1.jpeg)

![](_page_16_Picture_2.jpeg)

![](_page_16_Picture_3.jpeg)

 $\equiv$  Pollmeier

![](_page_16_Picture_4.jpeg)

![](_page_16_Picture_5.jpeg)

![](_page_16_Picture_6.jpeg)

![](_page_16_Picture_7.jpeg)

![](_page_16_Picture_8.jpeg)

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![](_page_16_Picture_10.jpeg)

#### **ForestValue**

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