STRENGTH AND STIFFNESS OF REINFORCED L-SHAPED AND T-SHAPED MORTISE AND TENON JOINT

14th INTERNATIONAL SCIENTIFIC CONFERENCE **WOODEMA**

Authors

Seid Hajdarevic, Murco Obucina, Alen Ibisevic, Ibrahim Busuladzic

Department of Wood Technology, Faculty of Mechanical Engineering Sarajevo, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

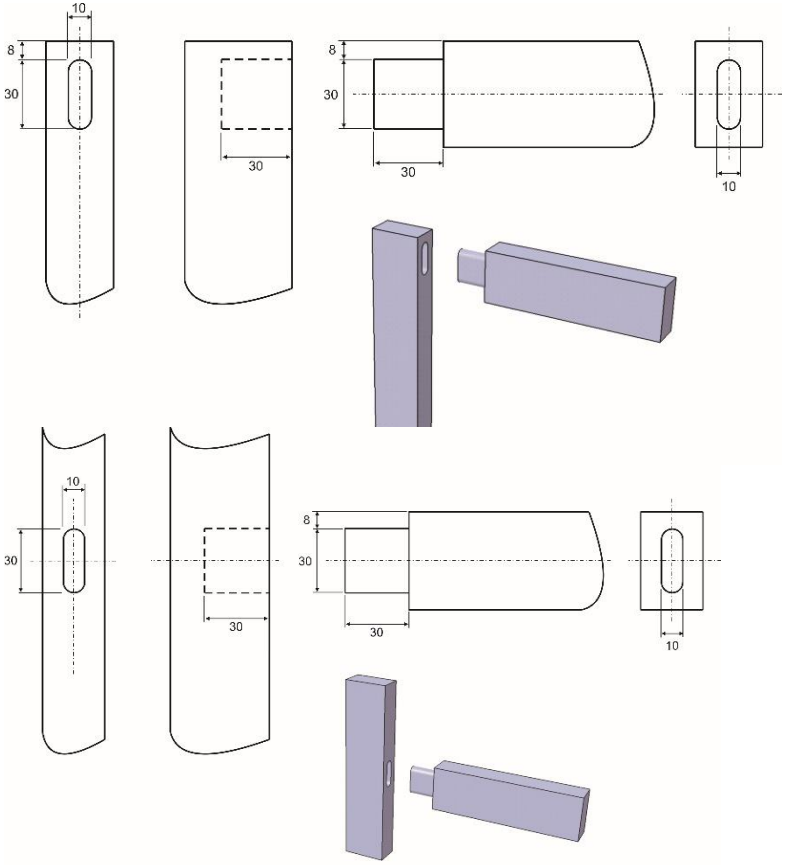
Koper, Slovenia, *June 16th - 18th 2021*

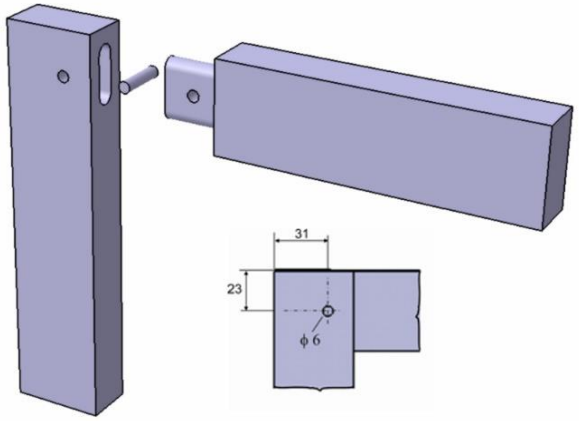
INTRODUCTION

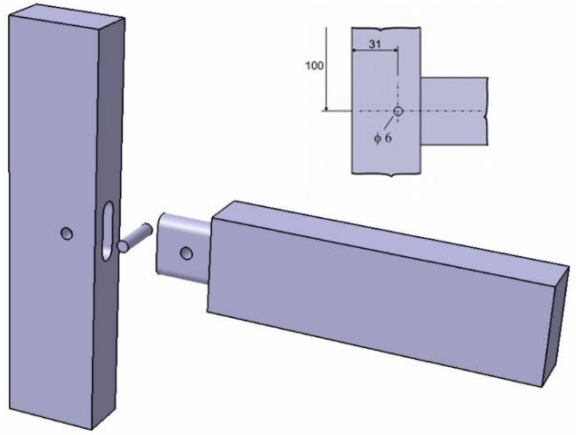
- Mortise and tenon joints are still the most common way of connecting wood elements
- Tenon geometry affects the mechanical properties of mortise and tenon joints
- Paper investigated the strength stiffness of reinforced L-shape and T-shape mortise and tenon joints
- The objectives were to determine the difference between the basic mechanical properties of reinforced and unreinforced joint
- The aim of the study was to explore the strength and stiffness that reinforcement contribute

MATERIALS AND METHODS

- Mortise and tenon joints: L and T shaped, beech wood, round peg shape, mortise and tenon interference fit, PVAc glue



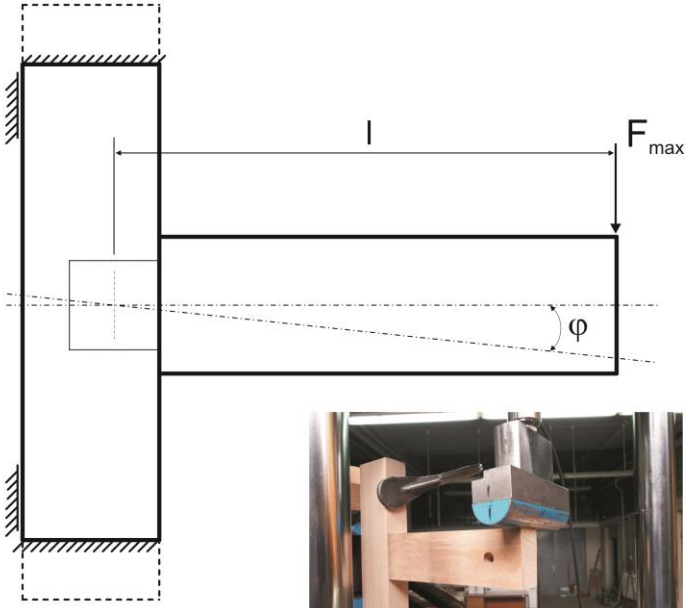




- Reinforced with round beech wood pegs (standard dowels)

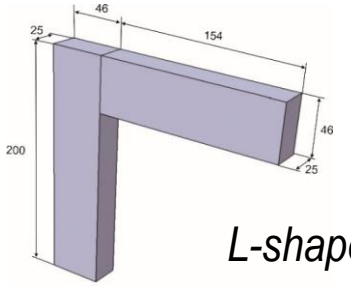
MATERIALS AND METHODS

- The loading diagram of specimens of L-shape and T-shape joints and tests setup

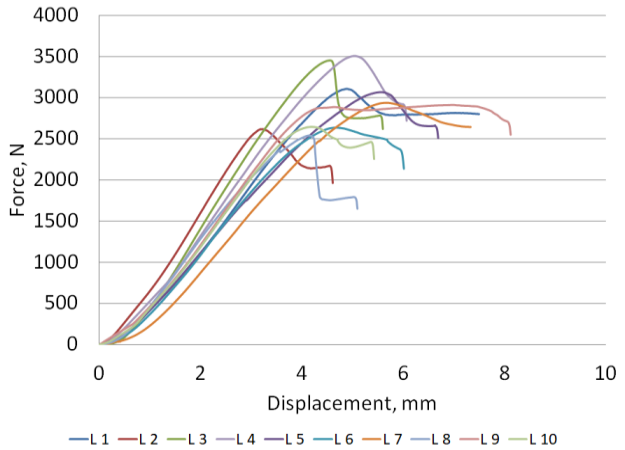


RESULTS AND DISCUSSION

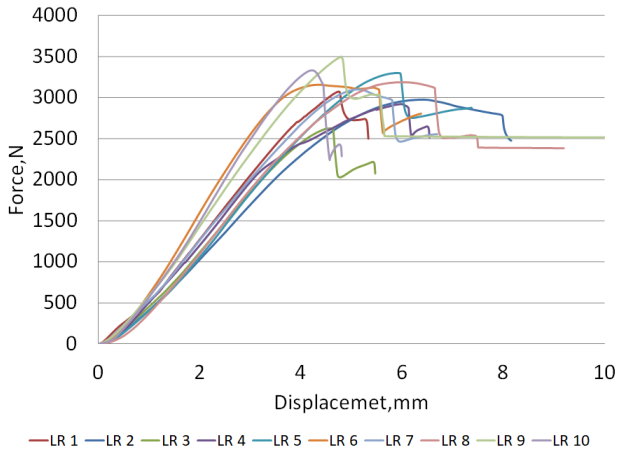
- The curves of force-displacement diagrams of the tested type of joints



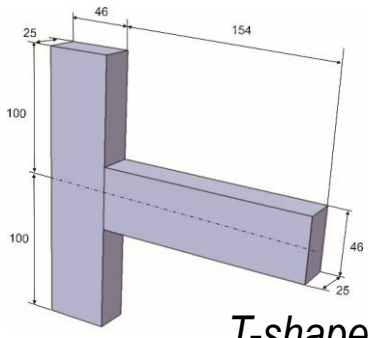
L-shape joints



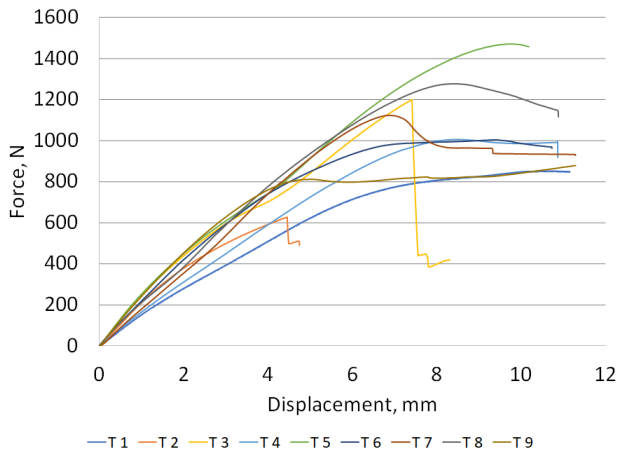
unreinforced

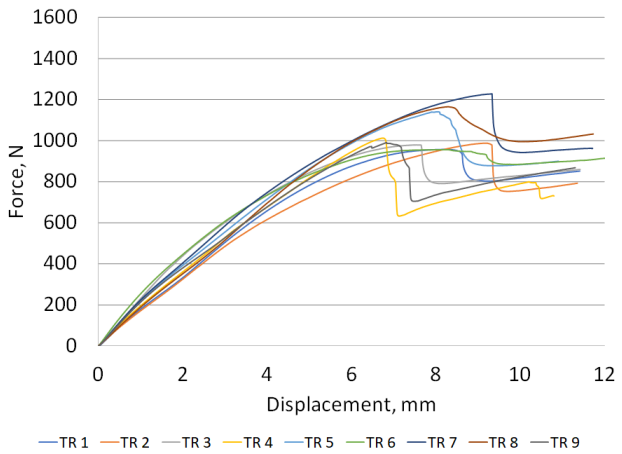


reinforced



T-shape joints





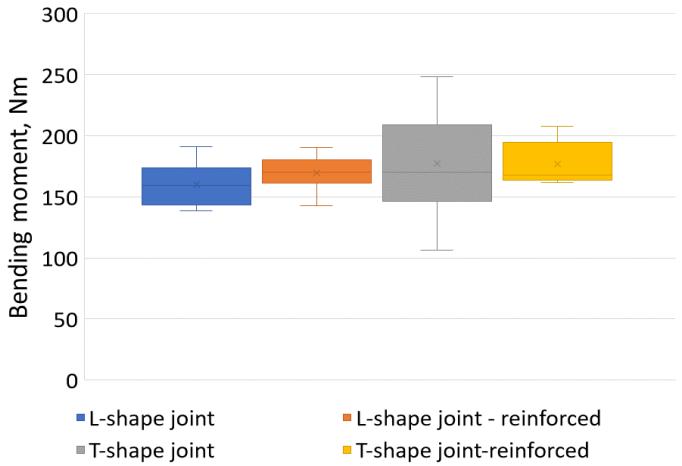
RESULTS AND DISCUSSION

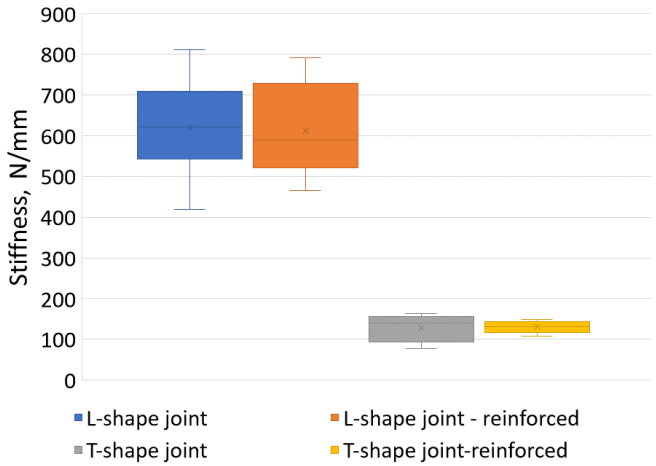
- Descriptive statistics

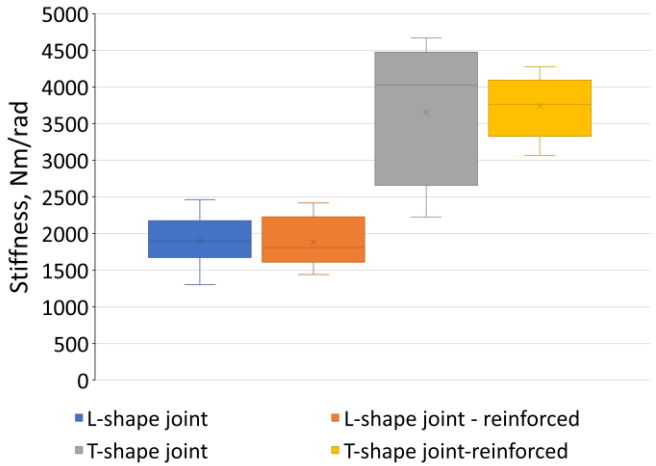
L-shape joint	Unreinforced L-shape joint				Reinforced L-shape joint			
	Mean	Median	Standard Deviation	Coeff. of Variation	Mean	Median	Standard Deviation	Coeff. of Variation
Force, N	2942.92	2925.23	345.47	11.74 %	3117.20	3128.16	243.64	7.82 %
Bending moment, Nm	160.24	159.28	18.81		169.73	170.33	13.27	
Displacement, mm	4.89	4.78	1.02	20.78 %	5.20	4.96	0.79	15.20 %
Stiffness coeff., N/mm	619.57	622.26	115.69	18.67 %	612.38	589.77	109.66	17.91 %
Stiffness coeff., Nm/rad	1898.18	1899.20	344.83	18.17 %	1880.36	1808.17	328.36	17.46 %
T-shape joint	Unreinforced T-shape joint				Reinforced T-shape joint			
	Mean	Median	Standard Deviation	Coeff. of Variation	Mean	Median	Standard Deviation	Coeff. of Variation
Force, N	1048.95	1006.14	251.73	24.00 %	1046.70	991.44	102.44	9.79 %
Bending moment, Nm	177.27	170.04	42.54		176.89	167.55	17.31	
Displacement, mm	8.54	8.49	2.10	24.63 %	8.06	8.16	0.90	11.20 %
Stiffness coeff., N/mm	127.81	140.87	33.63	26.31 %	130.91	131.52	14.74	11.26 %
Stiffness coeff., Nm/rad	3653.44	4024.40	960.50	26.29 %	3741.65	3760.30	420.94	11.25 %

RESULTS AND DISCUSSION

- Box and whisker plot - distribution of the results







- P-value – significant difference L and T shape joints without and with reinforcement

Data source	Variable 1	Variable 2	*p*-value
Bending moment, Nm	L-shape joints	Reinforced L-shape joints	0.2087
	T-shape joints	Reinforced T-shape joints	0.9805
Stiffness – N/mm	L-shape joints	Reinforced L-shape joints	0.8882
	T-shape joints	Reinforced T-shape joints	0,8035
Stiffness – Nm/rad	L-shape joints	Reinforced L-shape joints	0.9070
	T-shape joints	Reinforced T-shape joints	0.8039

CONCLUSION

- Bending moment and stiffness coefficients of unreinforced and reinforced L-shape and T-shape joints were investigated
- The joints were reinforced with standard dowels that passed perpendicularly through the geometric center of the tenon cheeks
- Due to different configurations of test specimens and tests setup, the testing results of the L-shape and T-shape joint were not comparable
- A significant difference was not detected between the bending moments and stiffness coefficients of unreinforced joints and the bending moments and stiffness coefficients of reinforced joints for all investigated type of joints
- The result showed that the reinforced joints did not have higher mechanical properties than unreinforced ones

THANK YOU

Seid Hajdarevic

+387 61 22 60 40

hajdarevic@mef.unsa.ba

http://www.woodema.org/