



TALLINN UNIVERSITY OF TECHNOLOGY  
SCHOOL OF ENGINEERING  
Department of Materials and Environmental Technology

**EFFECT OF VENEER THICKNESS AND SURFACE  
ROUGHNESS ON SHEAR BOND STRENGTH WITH  
DIFFERENT ADHESIVES**

**SPOONI PAKSUSE JA PINNAKAREDUSE MÕJU  
ERINEVATE LIIMIDEGA VALMISTATUD LIIMÜHENDUSE  
TUGEVUSELE**

MASTER THESIS

Student: Md Mishkat Hasan

Student Code: 194286KVEM

Supervisor: Dr. Heikko Kallakas, researcher

Co-supervisor: Dr. Anti Rohumaa, researcher

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## **SUMMARY**

Adhesives are widely used raw materials for woodworking technology, and the bonding technology of adhesives is considered a key technology for physically and mechanically stable wood products. However, this bonding technology of adhesives with wood is a complex mechanism and affected by several factors. Thus, this research aims to identify and analyze the effect of factors like species, veneer thickness, surface roughness, and adhesives on adhesive bond strength.

Four hardwood species, black alder, grey alder, European aspen, and silver birch, were used to prepare veneers with four different thicknesses of 1.0 mm, 1.5 mm, 2.6 mm, and 3.0 mm. The samples for bond strength evaluation were made from these veneers, while surface profiles of these samples were measured according to the test standard ISO 4287:1997. Before gluing and pressing operation, the pressing time was determined by combining the time required by different thicknesses to achieve the desired temperature and the curing time for adhesives suggested by the manufacturer. Furthermore, according to manufacturer instructions, the pressing temperature was determined, and the adhesive spread rate was kept constant for all adhesives to analyze their effect on bond strength. Finally, the bond strengths were evaluated by single lap shear testing according to the standard ASTM D7998 – 19 in the controlled laboratory environment.

However, analysis of the results obtained during this study showed that, generally, birch has better (7%-10%) and significantly different bond strength in general than Black Alder, Grey Alder, and Aspen. In contrast, bond strengths among the other three species are quite identical. Moreover, it has been observed that veneer thickness is one of the significant factors affecting the bond strength, and bond strengths increased significantly when veneer thicknesses increased. However, factors like surface roughness showed indecisive behavior as both lower and higher roughness profiles provided both lower and higher bond strengths. Moreover, no correlation was observed between roughness profiles and bond strength. Furthermore, adhesives showed that they are also significant factors affecting bond strengths. Moreover, among the adhesives, PF showed significantly better bond strength than other adhesives.

Overall, it seems that the thickness and adhesives are the most significant factors affecting the bond strength. However, factors like the anatomical structure of wood,

the effect of certain machining procedures, and adhesive penetration into the wood cell should be further investigated to precisely evaluate the adhesive bond strength.