

## **Abstract**

Timber has throughout history played an important role in all kinds of construction work as it is easy to work with and has many advantages compared to alternative materials. Through engineered timber products such as glulam, the natural variability in material properties of timber has been reduced, providing stronger, stiffer and more reliable structural elements. The purpose of this research is to make the environmentally friendly glulam beam, as well as to improve its mechanical properties. In this research, the construction and reinforcement of the glulam beam, using wood species of *Abies*, in two category of bonding of layers using adhesive and screw, as well as their comparison in terms of strength and stiffness, has been investigated. In the adhesive category, the bonding of wood layers was done using polyvinyl acetate resin and steel plate in the tensile and compression sections of the beam using epoxy resin. In the screw driving category, the connection of wood layers and steel straps was respectively done, with using threaded rod and screw (in compression and tensile of beam). experimental studies showed that stiffness on adhesive and screw reinforced specimens respectively increased to 179.15% and 162.74%. It was also observed that when reinforcing screw specimens using straps and end anchor, it is possible to increase the capacity of the final load of the screw laminated as much as glued laminated beam specimens or even more. Theoretical studies showed that the slip of the layers in screw specimens is far more than the adhesive specimens, which can reduce the slip and increase the stiffness with using end anchor. Although the reported results of screw category were less than adhesive category, but their compatibility with the environment, the ability to recycle, disassemble and reassemble them, is very valuable compared to adhesive examples.

**Keywords:** Glulam beam, *Abies* species, straps, screws, threaded rod, stiffness, slip



University of Zabol  
Graduate school  
Faculty of Engineering  
Department of Civil Engineering

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# **Experimental study of the effect of screw and plate on the behavior of glulam beam**

**Supervisor:**  
Dr. MR. Hoseini Tabatabaei

**Advisor:**  
Dr. A. Bayat Kashkoli

**By:**  
D. Mashayekhi

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