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NUMERICAL ANALYSIS OF GLULAM BEAMS WITHOUT AND WITH GFRP REINFORCEMENT

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Summary: This work presents a numerical analysis, using the software ANSYS, about glued laminated timber beams (GLULAM) without and with a Glass Fiber Reinforced Polymer (GFRP) reinforcement. The beams were composed of six sheets of lumber with a nominal thickness of 3.5 cm. In the case of reinforced beam, the reinforcing layer is positioned between the last and the penultimate lumber sheet on the bottom edge. The thickness of the glass fiber is 0.6 cm corresponding to about 3% of the beam cross-section. In numerical analysis were obtained the values of the stresses acting on timber and fibers, strains, and the vertical displacements at mid-span of the beam, for a four points loading. The numerical results were compared with results obtained by theoretical analysis and experimental results of prototypes in a natural scale. In the theoretical and numerical analysis was considered the properties of elasticity of each lumber sheet previously evaluated by static bending test. The lumber under compression was considered with a elastic-plastic behavior; lumber under tension and the reinforcement layer were considered with a elastic behavior until failure. The results indicated a good agreement of the values obtained by numerical analysis and theoretical analysis with the experimental vertical displacements, measured in the linear range. There was good agreement too between the stress values obtained by numerical analysis and the theoretical analysis at the failure of the beams.