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EXPERIMENTAL AND THEORETICAL ANALYSES OF IROKO WOOD LAMINATES

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Abstract

This paper reports the experimental tests, which have been carried out to assess the mechanical properties of Iroko wood laminates used for the construction of a large wooden sailing ship. Three-point bending tests have been carried out on different types of specimens: laminates with 3 layers @ 0° and without scarf joints, laminates with 3 layers @ 0° having the outer layers with scarf joints, and laminates with 4 layers @ 0°/±45°/0° and no scarf joints. The tests have been performed in compliance with the current EN Standards. The analyses of the experimental data allowed the assessment of the mechanical properties of the laminated Iroko wood as well as the influence of scarf joints. The experimental results demonstrated that the presence of scarf joints only affect the strength of the glued laminate, while the stiffness properties in terms of Young modulus in bending and shear modulus, obtained applying the "method of variable support span", remain essentially the same. The investigated laminates have been also analysed using a 3D computed tomography and an ultrasonic phased array equipment in order to assess the dimensions of possible defects or voids in the adhesive and the dynamic modulus of elasticity. The tomographic measurements of the glue thickness explained the reason of the reduced strength of the scarf joints, due to the inhomogeneity of the glue bond-line. The value of the dynamic modulus of elasticity, obtained by the ultrasonic technique, is slightly higher than the value of the modulus of elasticity obtained by the bending tests. Finally, the experimental findings have been compared with those drawn from both Classical Lamination Theory and Dietz approach, obtaining a good

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