

Elastic Constants of Fir Wood Using Ultrasound and Compression Tests

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Abstract : Elastic constants of Fir wood (*Abies cilicica*) have been investigated by means of ultrasound and compression tests. Three modulus of elasticity in principal directions (EL, ER, ET), six Poisson's ratios (ν_{LR} , ν_{LT} , ν_{RT} , ν_{TR} , ν_{RL} , ν_{TL}) and three shear modules (GLR, GRT, GLT) were determined. 20 x 20 x 60 mm samples were conditioned at 65 % relative humidity and 20°C before testing. Three longitudinal and six shear wave velocities propagating along the principal axes of anisotropy, and additionally, three quasi-shear wave velocities at 45° angle with respect to the principal axes of anisotropy were measured. 2.27 MHz longitudinal and 1 MHz shear sensors were used for obtaining sound velocities. Stress-strain curves of the samples in compression tests were obtained using bi-axial extensometer in order to calculate elastic constants. Test results indicated that most of the elastic constants determined in the study are within the acceptable range. Although elastic constants determined from ultrasound are usually higher than those determined from compression tests, the values of EL and GLR determined from compression tests were higher in the study. The results of this study can be used in the numerical modeling of elements or systems under load using Fir wood.

Keywords : compression tests, elastic constants, fir wood, ultrasound

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