

Experimental and numerical investigation of the mechanical behavior of full-scale wooden cross arm in the transmission towers in terms of load-deflection test

ABSTRACT

This paper aims to carry out an experimental and numerical investigation of the mechanical behavior of full-scale wooden 123 KV 13 L Cross-arm that used in transmission towers. Two points bending test was conducted to obtain load-deflection data of both scenarios, normal condition scenario and broken wire condition scenario. Balau wood was used to fabricate the whole structure of the cross-arm which includes main, tie and bracing members. When it comes to the normal condition, standard load 7.98 K N, with 8 organized steps with angle $\Theta = 54.2^\circ$ at YZ plan from Y-axis were applied. while $F_r = 16$ K N with 16 organized steps with angle $\Theta = 12.6^\circ$ at the horizontal plan, $\alpha = 17.57^\circ$ at vertical plane was applied for the broken wire condition. Deflection values due to these loads were determined by using 25 dial gauges that installed on both main members and tie members. Load-deflection investigation of both X–Y plots was considered for the main members while the Load-deflection investigation of Y plot was considered for tie members. Experiments of load-deflection data were validated by conducting a simulation process of normal conditions. The simulation process was designated to the first point (at R,L 734 mm) on the main members in both directions X and Y-axis during the normal condition. The numerical results of simulation have proven that the experiments were confident 93%.

Keyword: FEM; Simulation; Cross-arm; Load-Deflection; Balau wood