

Mechanical and physical properties of cross-laminated timber made from batai using different glue spread amounts

ABSTRACT

This study aimed to determine the mechanical and physical properties of the Cross- Laminated Timber (CLT) glued with different amounts of glue. Cost of glue is the utmost importance where it will help in reducing the CLT manufacturing cost. Four different amounts of glue spread were used where the glue that used was phenol-resorcinol formaldehyde (PRF); 150, 200, 250 and 300g/m². The testing of the CLT was conducted by following BS EN 408:2010, BS EN 16351:2015, ASTM D 2718 method B, ASTM D 143-94 and Japanese Agricultural Standard (JAS) 1152:2007. The analysis of physical tests that have been carried out are density, moisture content, shrinkage and swelling of the CLT's thickness. Meanwhile, the mechanical tests were compression parallel and perpendicular to the grain, three-point bending test (flatwise and edgewise of CLT) and shear test. The highest density was shown by the CLT that using 300 g/m² which the value was 316.41 kg/m³. Whereas the highest moisture content was shown by CLT that used 250 g/m² with 15.49% in value. The highest thickness shrinkage percentage was 2.50%, CLT with 200g/m² while the highest thickness swelling percentage was 5.60% which the CLT used 150 g/m². For the flatwise bending test, it shows that the CLT that used 300 g/m² has the highest MOE and MOR value which were 510.63N/mm² and 8.39 N/mm². The MOE and MOR value for edgewise bending also shows that CLT that used 300 g/m² was the best with 1528.70 N/mm² and 13.48 N/mm². In compression perpendicular to grain test, the CLT with 150 g/m² shows the highest value of MOE which was 5.89 N/mm² while CLT that used 200 g/m² has the highest value of compressive strength with 9.10N/mm². However, for compression parallel to grain test, the CLT that used 300 g/m² shows the best performance with 1002.78 N/mm² and 13.75 N/mm² of MOE and compressive strength value. Lastly, for the shear test, the highest shear strength value was 0.39 N/mm² which belongs to CLT that used 150 g/m². Thus, CLT that used 300 g/m² of glue spread amount is the best CLT which, the more the amount of glue, the better the performance of the CLT.