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Name : WAN HAZIRA BT. WAN MOHAMAD

Title : PROPERTIES OF SINGLE AND MIXED SPECIES GLULAM FROM SELECTED LOW-GRADE MALAYSIAN TIMBERS

Supervisor : PROF. DR. ZAKIAH AHMAD **(MS)**
DR. SHAIKH ABDUL KARIM YAMANI ZAKARIA **(CS)**

Heavy timber construction in Malaysia generally uses heavy and medium hardwood timbers with strength groups between SG1 to SG4. Light hardwood timbers with strength group of SG5 to SG7, which are also known as low-grade timbers are mostly used for non-structural applications and this does not represent an efficient use of available timber. Thus, one of the ways to fully utilize and upgrade the value of these timbers is by converting them into glued laminated timber (glulam). Glulam allows the use of any timber species be it low-grade timber, small diameter trees, plantation and fast growing timber species, as long as the timber species selected have good gluing characteristics and can fulfill the production and structural requirement of glulam. Glulam also offers the opportunity to combine high-grade timber at the outer laminations with low-grade timber at the inner laminations, producing a mixed-species glulam. This study investigates the effect of using Malaysian lower grade timber species combined with higher grade timber species in the manufacturing of glulam. Two types of glulam beams were prepared; (i) mono species with uniform layup using Kapur, Merpauh, Resak, White Meranti, Bintangor, Jelutong and Sesendok, and (ii) mixed species with balanced layup whereby higher strength grade timbers i.e. Merpauh and Kapur were equally positioned at the outer layer and the lower strength grade timbers i.e. Jelutong and Sesendok were positioned at the inner layer. Ten-layered glulam beams were prepared in accordance with MS758. A series of tests were performed namely flexural, delamination and block shear tests. Prior to glulam manufacturing, the flexural properties of solid timber beam in structural size and the effect of two different finger lengths on flexural properties of finger jointed beams were determined. The wetting properties of PRF on timber species studied were also tested. Results obtained showed that the order of flexural strength for solid timber beam in structural size is Resak, Kapur, Bintangor, Merpauh, White Meranti, Sesendok and Jelutong. The flexural strength of finger-jointed lamellas were affected by the finger length whereby finger-jointed lamellas with 25 mm finger length was higher than flexural strength of finger-jointed lamellas with 15 mm finger length. All the timber species show contact angle below 90 degrees indicating PRF has good wettability with the timber species studied. Single species glulam manufactured from White Meranti and Resak obtained the highest and lowest MOR value, respectively while Resak and Sesendok obtained the highest and lowest MOE value, respectively. The order of flexural strength for single species glulam is White Meranti, Jelutong, Kapur, Sesendok, Bintangor, Merpauh and Resak. Glulam manufactured from the combination of Sesendok-Merpauh (SMR) obtained higher MOR and MOE values compared to other mixed species glulam and also compared to its single species glulam. Except for Resak and Kapur, all the single species glulam fulfilled the MS758 delamination requirement and all the single species glulam fulfilled the MS758 shear requirement. All the mixed species glulam fulfilled both delamination and shear requirement. The results obtained provide positive indication for using low-grade timber in glulam beams.