

UNIVERSITI TEKNOLOGI MARA

**EFFECT OF ACCELERATED
WEATHERING ON THE STRENGTH
PROPERTIES OF GLULAM
PRODUCED FROM MENGKULANG
TIMBER TREATED WITH LIGHT
ORGANIC SOLVENT
PRESERVATIVES (LOSP)**

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Thesis submitted in fulfilment
of the requirements for the degree of
Master of Science

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a panel of examiners has met on 26th November 2018 to conduct the final examination of Syarifah Hanisah bt Syed Mokhtarruddin on her **Master of Science** thesis entitled “Effect of Accelerated Weathering on The Strength Properties of Glulam Produced From Mengkulang Timber Treated with Light Organic Solvent Preservatives (LOSP)” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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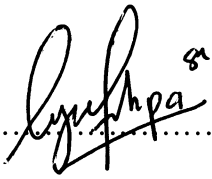
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ABSTRACT

Glulam produced from low-grade timber should be treated to increase its durability against termites and insects' attacks when exposed to outdoor environment. The main objective of this work was to investigate the effect of a number of factors, namely Light Organic Solvent Preservatives (LOSP) as environmental friendly of timber preservative and accelerated weathering using QUV machine, which could be applied to compare solid beams and glulam beams in the strength properties. The samples then were treated using LOSP and then were subjected to accelerated weathering in accordance with ASTM G 154. The size of the solid beams and three-ply glulam beams is 50 mm(W)×60 mm (T)×1200 mm (L) as accordance with BS EN 408. Phenol resorcinol formaldehyde (PRF) resin was used as the adhesive for the manufacturing of glulam beam. The strength properties was measured through flexural strength test (in accordance with BS EN 408) over a range of Modulus of Rupture (MOR) and Modulus of Elasticity (MOE). Subsequently, the strength properties assessment by Block Shear Test and Delamination Test to measure the bonding strength of glulam beams (in accordance with MS 758). Chemical analysis on the penetration of LOSP into the timber was also investigated using high performance liquid chromatography (HPLC). Statistical analysis (ANOVA) was carried out to determine the effects of the variables on the strength properties of solid timber and glulam. The results revealed that the MOR value after flexural strength test showed a decreasing pattern for both solid beams and glulam beams after being treated with LOSP. The same pattern also repeated for flexural strength test in solid beams and glulam beams after accelerated weathering. Indeed, the same pattern goes to solid beams and glulam beams treated with both factors. Comparison between solid beams and glulam beams showed that the strength values of solid timber beams are extensively decreasing in strength value after all the treatment. However, glulam showed a different pattern, in which gradually decreasing after all the treatment. This supports that glulam beams performed better and more stable than solid timber beams. Glulam in this study showed good bondability between the wood and resin after being treated with LOSP and undergo accelerated weathering. It was found that wood failure resulting from shear strength achieved approximately 90 %. Delamination of glue line in this study was acceptable as it was in the range of 5.49 % to 12.39 %. Thus, glulam shows a good bondability between timber and adhesive after being treated with LOSP and undergo accelerated weathering. In conclusion, all glulam beams with and without LOSP treatment and accelerated weathering passed the criteria of Malaysian Standard for glulam timber.

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