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FEASIBILITY OF USING PALMYRA STRIPS AS REINFORCING MATERIAL IN LIGHTLY LOADED CONCRETE BEAMS

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Abstract: Contemporary development projects have seen a rise in reliance on conventional building materials like steel, prompting global efforts to explore alternative reinforcement options. However, limited technical information on locally available materials has led to consumers relying on readily accessible information about industrialized materials. One potential alternative is Palmyra, a structural timber found in Sri Lanka's northern region. This study aims to evaluate the feasibility of using Palmyra strips as reinforcement material in concrete applications. Initial evaluations involve examining the mechanical properties of Palmyra wood, casting beams with steel reinforcement and Palmyra strips, and subjecting them to four-point bending test. To enhance durability and water resistance, the Palmyra strips were treated with varnish, sand pressing, and a 24-hour drying period. The control specimen had 8 mm diameter steel reinforcements, while the full replacements were 20 mm x 20 mm Palmyra wood strips. For the partial replacement, the top reinforcement was made of 20 mm palmyra wood, and the bottom reinforcement was made of 8 mm diameter steel. Specimens were cured for 28 days. The deflection at the midpoint was measured, and stress-strain curves were generated. The test results showed that the full and partial replacements of steel with Palmyra strips showed up to 9 % reduction of the average maximum strength compared to the control specimens while showing up to 43 % of enhancement in the maximum strain. Correspondingly, an enhancement of the strain energy values at the point of maximum stress was observed in both partially replaced, and fully replaced beams. Cracking is consistently initiated from the bottom, resulting in shear failures. The findings suggest that full and partial replacements of top reinforcement can be adopted in lightly loaded concrete beams with marginal changes in strength capacity while having enhancement in strain and energy absorption capacities.

Keywords: Alternative reinforcement; Concrete beams; Flexural response; Palmyra strips