UNIVERSITI TEKNOLOGI MARA

DESIGN OF MODULAR MOBILE HYBRID TIMBER BRIDGE REINFORCED WITH CARBON FIBER REINFORCED POLYMER (CFRP)

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ABSTRACT

Stream crossing or bridge is one of the components in forest road network. Good forest road network and stream crossing will allow for post harvesting activities as monitoring and research activities to be carried out within the schedule. During harvesting period operations, bridges are constructed temporarily and normally will last less than 5 years due storms and floods during monsoon season. Building the permanent bridges incurs high cost if there are numbers of streams to cross and the structure would easily collapse. This study proposes modular and mobile forest bridge with use of lightweight materials that are timber, aluminium and carbon fibre reinforced polymer (CFRP) for easy transportation and installation and at the same could be used at multiple sites. Finite Element Analysis (FEA) had been defined I-shaped cross section of structural shape to be used in the proposed timber bridge. Design Connector 1 was selected to be used to join the five segmented timber beams to develop 10m girder span. 6mm thickness of CFRP found to be an optimum thickness for I-shaped timber beam reinforcement. Considering stress at top side of specimen and deflection at bottom side of specimen, the reinforcement observed decrease stress and displacement for 2m timber beam up to 33.43% and 61.56% consecutively. The reinforcement also observed reduce the stress and displacement value for a single girder up to 29.20% and 58.96% consecutively. Difference of displacement value between FEA and bending test experiment at mid-span of specimen is only 3.29%.

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