# Nonlinear Numerical Modelling of FRP Reinforced Glued Laminated Timber

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Summary:

Fibre-reinforced polymers (FRPs) are effective in the flexural stiffening and strengthening of structural members. Such systems can be optimised if accurate numerical models are developed. At present, limited information is available in the literature on numerical models that can predict with good accuracy the nonlinear behaviour of FRP reinforced low-grade glued laminated timber beams. This paper discusses the development of a finite element model, which incorporates nonlinear material modelling and nonlinear geometry to predict the load–deflection behaviour, stiffness, ultimate moment capacity and strain distribution of FRP plate reinforced glued laminated timber beams manufactured from mechanically stress graded spruce. Beams with and without sacrificial laminations are modelled and their performance is compared to unreinforced glued laminated timber beams. The model employed anisotropic plasticity theory for the timber in compression. The failure model used was the maximum stress criterion. Strong agreement was obtained between the predicted behaviour and the associated experimental findings. It was deduced from comparing the results from the numerical model with experimental findings that the FRP plate succeeds in increasing the performance of the adjacent timber significantly. The model is a useful tool for examination of the effect of reinforcement percentage and will be used for optimisation of the hybrid beam.

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**Resource Link**

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