A Composite FRP-Glulam Beam with Enhanced Fire Performance

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INTRODUCTION

Increasing demand on infrastructure and innovation in materials due to increases in:

Population Urbanisation Global Warming

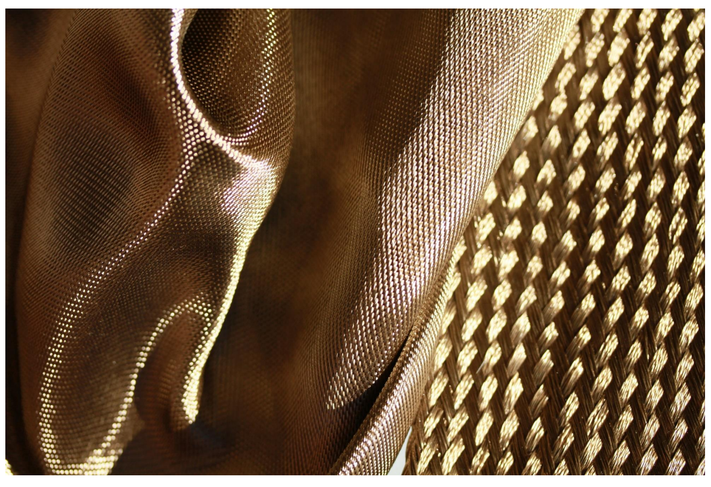
Timber has been adopted as a building material with a lower embodied energy than concrete and steel. Reduction in the capacity of timber in the event of a fire is an attribute that requires attention.

Use of timber is increasing in the built environment

RESEARCH AIMS

Study the reduction in Modulus of Elasticity (MoE) of timber under elevated temperatures

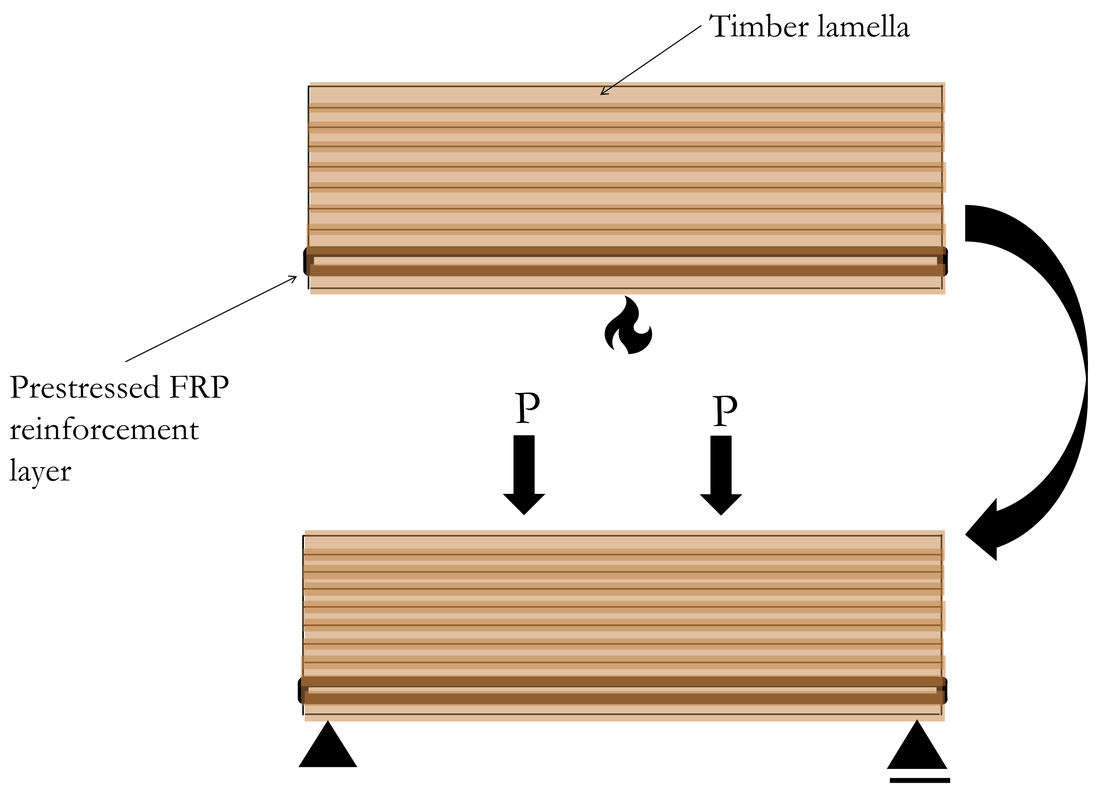
Proof of concept for a prototype FRP-Glulam beam with enhanced fire performance



Composite fibres to be used to create a composite material: FRP –Glulam beam

METHODOLOGY

Prestressing of the reinforced timber is conducted by drying the lamella to 4% moisture content, gluing the FRP and then restoring moisture content.



Residual testing of strength of composite material, in comparison with unreinforced beams to demonstrate the benefits of the FRP.

The study also aims to quantify the change in the Modulus of Elasticity under elevated temperatures, by also obtaining the residual capacity of the same.

PRELIMINARY OUTCOMES

Exposing the prepared samples to a heat flux of about 50 kW/m^2 gives the times for the 300^o Isotherm layer to reach three predetermined depths that are critical for testing the effectiveness of FRP reinforcement. This time is calculated based on a peak char rate of 1.3 mm/min (Emberley, 2017).

Depth of 300^o Isotherm (mm)	Time (min)
16	12.3
32	24.6
48	36.9

CONCLUDING REMARKS AND FUTURE WORK

From previous studies conducted, there have been indications of the benefits of FRP glulam beams under thermal loading. However, delamination of the FRP from the timber caused the nature of the composite material to be lost, using basalt FRP and using prestressing techniques, this study aims to reduce this issue. The benefits of the reinforcement, in the event of fires will be shown through testing of the samples. The model is aimed to be more accurate by using a characteristic MoE for each lamella.