

# 2013/14 Undergraduate Research Grant Scheme – Executive Summary

**Project title:**

An investigation into the engineering properties of structural timber in historic buildings

**University:**

University of Bolton

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**Project summary:**

Engineers involved with heritage projects often come across the problem of having to apply properties to historic timber in order to make an educated guess of its bending strength. There is currently a lack of information available to engineers as to whether visually grading old timber and applying properties in accordance with BS5268 is an appropriate way to obtain values for design, this can lead to unnecessary and often costly strengthening works.

In summary, tested values of modulus of rupture (bending strength) were compared with values which would be obtained by an engineer if they were to visually grade the timber using BS4978 and apply grade values from BS5268. Also, the results were grouped according to whether the annual growth rings were orientated parallel or non-parallel to the load. The failure modes were also noted. The results which were found may cause an engineer to think about the following points:

- The testing of the specimens led to significantly higher grade bending stresses than given in BS5268. This suggests that the grade bending stresses in BS5268 are too conservative.
- The testing of the specimens with annual growth rings orientated parallel to the load provided greater modulus of rupture (bending strength) values than those orientated non-parallel to the load. Is this a factor which could be considered in the appraisal of existing structures? The direction of load in relation to the slope of the grain is already taken into account.
- 16% of the specimens failed in a brittle manner and gave little warning before breaking. Engineers generally assume that timber elements would give plenty of warning before failure occurred (i.e. excessive deflection). This assumption was not proven by the testing carried out.