

IMPROVEMENT OF SHEAR CAPACITY IN BAMBOO REINFORCED CONCRETE

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ABSTRACT

In modern construction, steel is the material of choice for reinforcing concrete against various tensile stresses. However, the high financial and energy costs involved in extracting and processing steel has led scientists and researchers all over the world to seek alternative materials for use in structural systems. Bamboo as an alternative for steel reinforcement in light weight concrete constructions is one such option which has gained popularity among researchers in recent years in different parts of the world. However, there is a very little amount of studies done in this area on bamboo in Sri Lanka.

Bamboo cannot completely replace steel in reinforcing; however its usage has the potential to dramatically reduce the steel requirement for small scale constructions, especially when it comes to the construction of single storey and low-rise buildings. According to the data from “*National census on occupied housing units in 2012*”, single storied houses in Sri Lanka amounts to a very significant 85% of the country’s total occupied housing units. Thus, developing an effective and efficient way to utilize bamboo in light weight concrete structures such as lintels, plinth beams, sill beams and continuous roof bands in single storey and other low-rise buildings would significantly reduce the need for steel and hence the cost for construction in Sri Lanka. Further, dissemination of such knowledge among people will significantly improve the robustness of these building by making them to incorporate these simple yet important disaster resistant features into their housing units.

The scope of the laboratory testings’ done by Mendis et al. in 2009 were limited to the bamboo reinforced concrete beams without shear reinforcements to simply monitor the behavior of this new material under different loading conditions. As expected the failure modes were brittle failure modes in shear. As a continuation of the same study, the main objective of the research work was to design and propose a suitable method to improve the shear capacity of this beam. Since longitudinal arrangement of bamboo splints are not sufficient to prevent the propagation of the diagonal shear crack, the idea was to incorporate bamboo splints vertically. However, due to practical difficulties in maintaining a uniform cross-section in bending bamboo splints to a rectangular shaped shear link different shapes were tried during the research study.

To compare the effectiveness of this method, another beam with a steel and bamboo composite reinforcement arrangement was also considered. A steel-reinforced concrete beam with the same dimensions was also used as a control beam. The beams thus constructed will then be tested with the same loading arrangement and the results will be presented with conclusions and recommendations in the full paper. These tests will be further combined with tensile tests and pull-out tests to further investigate the material properties.

Key words: *bamboo reinforced concrete, shear links, shear failure*