STRAW BONDED SOLID PANELS – THE CONSTRUCTABILITY AND STRUCTURAL BEHAVIOUR

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Abstract: Straw bonded solid panels manufactured as boards with a thickness of 58 mm can be used for many applications such as internal partitions, floor boards, acoustic panels, ceiling, etc. However, there have been many issues related to the use of straw panels as a load bearing material for walls. This paper describes the details and results of a full scale load test carried out with straw bonded solid panels to assess the constructability, structural adequacy with short term loads and sustained loads. It also indicates the trends that can be expected with thermal performance.

1. Introduction

In Sri Lanka, the total amount of rice produced is 2.79 million metric tons in year 2009. This could increase to about 3.83 million metric tons by year 2020. Every ton of rice would produce 0.4 tons of straw. This straw may have many uses. Straw is considered as a very good organic material for restoring the soil quality. It can be used for manufacturing of paper. Many countries uses the readily available wheat straw which is renewable annually, to produce ethanol fuel as a cheap alternative to imported crude oil fuel. The use of straw for manufacturing of solid panels is another application practiced universally. A solid panel is shown in Figure 1. Figure 2 shows the dense arrangement of straw within the panel. The straw is placed in the transverse direction. Therefore, the panel can derive a considerable flexural strength in that direction and hence, it is advisable to support the panel at 1.2 m when used as a structural member carrying loads that can cause flexture.

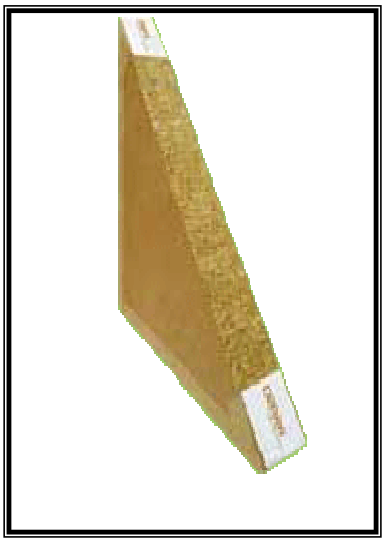

Figure 1: A DURRA straw panel of 1.2 m width x 2.4 m length

Figure 2: Cross section of a DURRA straw panel with straw arranged in the transverse direction

These panels show promise with cost competitiveness and robustness though it may have few durability related issues that should be addressed. If the data on structural performance is available, it would be possible to overcome durability related issues easily with suitable water proofing system.

Further the design trends of built environments slowly change in style, type, social acceptance, and principals that can be identified roughly based on decade by decade basis. In 70's it was energy efficient design and passive solar energy concepts. In early 80's with the higher cost of energy efficient built environment, it was more about modern designs. In 90's it was a re-interpret of successful older designs into more contemporary modern designs. In the first decade of the 21st century, it appears recycled or green built environment will be given priority (LEED's with U.S. Green Building Council USGBC). The designs that conserve energy and environmental may be appreciated. In this context, straw is sustainable, recyclable, and biodegradable.

This paper describes a full scale load test carried out using a model to assess the structural capacities and performance especially at ultimate limit state along with few specific issues that may need addressing with respect to constructability.