DIFFERENT TYPES OF CONSOLIDATED BEAMS

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Abstract*: In this paper are presented some types of reinforcements for the wood beams. The GFRP reinforcement depends on the material applied on the wood beams and also on the beam essences used for doing the tests. The use of GFRP composite materials as reinforcement for wood beams under bending loads offer higher strength and increased Young modulus so the main idea of the paper is that we can obtain good strength for the wood beams package until they crash.*

Keyword: ash beam, beach beam, package, GFRP

1. Introduction

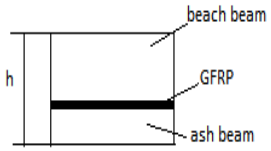
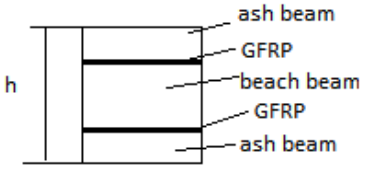
In this study is presented the possibility of using GFRP for increasing the strength of the wood beams. The epoxy resin is used to make a very good link between reinforcements [1,4]. The beams from this paper will be subjected to bending and by adding GFRP for reinforcement the stress from the bending will be distributed across the surface of the elements that are in contact one another which it means that the whole package will be more resistance and more rigid [5,7].

2. Experimental study

In this experimental study the wood beams used for being tested have been cut and finished to the required sizes and were obtained from dry wood of beech and ash. It is good that wood does not have any damages, cracks or knots and the internal wood fibers be continuous without stress concentrators. The all 12 beams are reinforced with GFRP. The final dimension for the beams was 20x25x500mm and also 20x35x500mm [2].

Six beams were reinforced using one glass fiber fabric in the middle of the package and glued by epoxy resin. The glass fiber fabric has been cut at a width equal to 20 mm and the length of 500 mm for type A and also for type B beams. The other six beams were reinforced with two glass fiber fabric between the beams and glued by epoxy resin [6].

Table 1. Types of wood beams and types of reinforcements

Type / Wood	Beach/Ash	Type of reinforcements
Type A	20x25x500mm h=25	
Type B	Ash/Beach/Ash	
	20x35x500mm h=35	

The testing device was especially conceived for these types of beams to allow the mechanical tests performed to determine which type of beams are more resistant. The machine used for doing the test is the universal hydraulic press utilized in material strength studies [3].

Type (A) of the wood beams reinforcement is presented in the fig.1 from below where we can see they are two wood beams (beach-ash) with one fabric of GFRP (in the middle) and glued with epoxy resin. Glass fiber was also cut every time at the needed dimensions.

Fig. 1 Reinforced wood beam (Type A)

Type (B) of wood reinforced beams is shown in the fig.2 from below where we can see the ash-beach-ash wood beams with two GFRP fabrics glued with epoxy resin.

Fig.2 Reinforced wood beam (Type B)

Regarding the glass fiber fabric, after it is placed on the wood beams, with epoxy resin, we have to press uniformly to get a perfectly flat surface as the beams can be glued ensuring that the tests are carried out correctly [5]. After testing this type of reinforcement we can see that the ash beam from below it is first destroyed or cracked but not entirely (fig. 3). This is an important information because we can have a perspective on the behavior of a real beam that is part of a construction and we can make an approximation of how it degrades the beam under the action of bending forces.

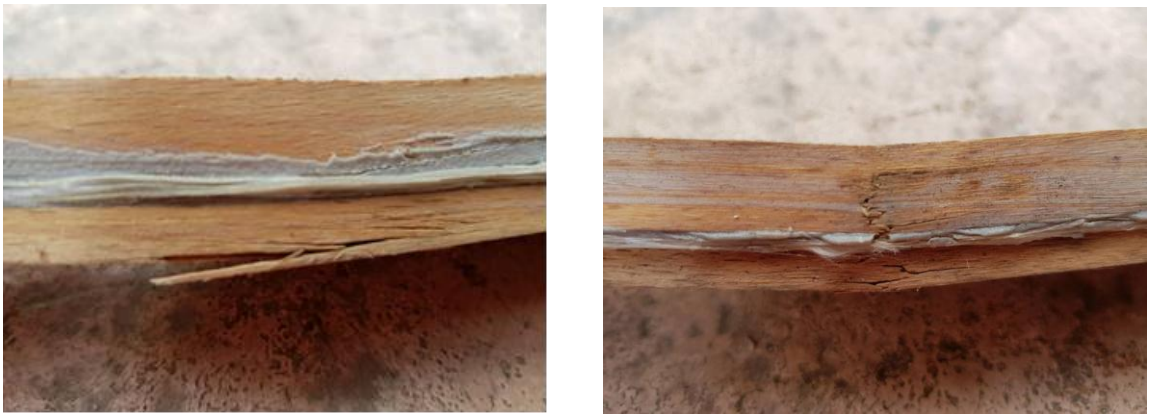


Fig. 3 Type A beams after bending test

The results of the displacements got at the bending tests for a reinforced wood beams of Type A (beach/ash) are shown in following figure:

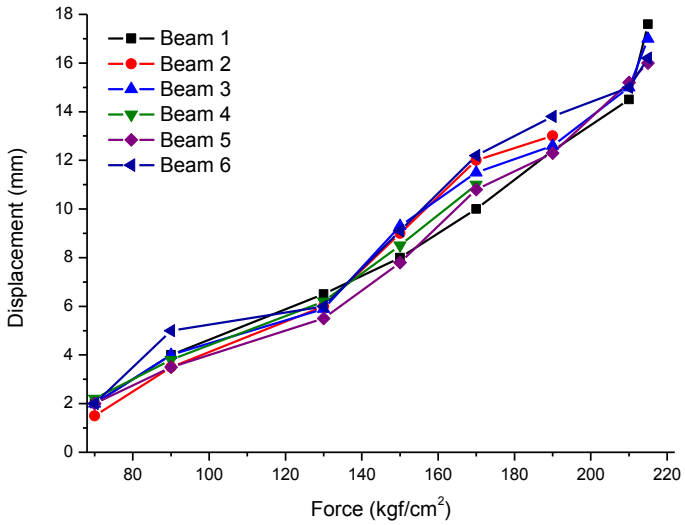


Fig. 4 Type A - the dependence between the force and the displacement of the beam

From this figure we can observe that until 160kgf/cm2 the beams have almost the same behavior after that some of them crashed and other resist until 220kgf/cm2.

This type of reinforcement can be easily destroyed after the maximum force but until then the beams don't crash instantly because of the GFRP fabric which improve their resistance.

For the other six beams with the type B reinforcement (ash/beach/ash) we can see in the next figure that they are partially destroyed meaning that the GFRP allows the beams to withstand a high bending force before breaking completely.

We can see also that during the performed test detachments of the types of wood used may occur due to resistance differences of these wood essences.

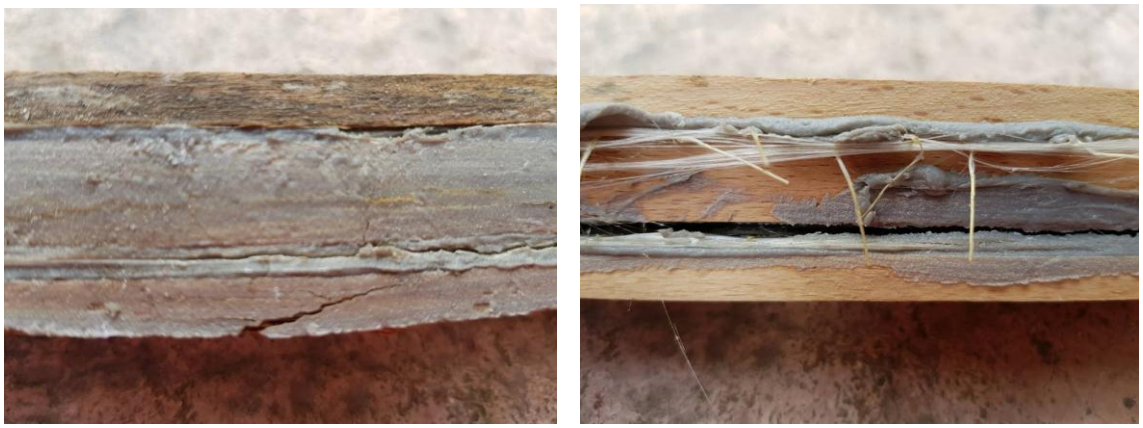


Fig. 5 Type B beams after bending test

The results of the displacements got at the bending tests for a reinforced wood beams of Type B (ash/beach/ash) are shown in following figure:

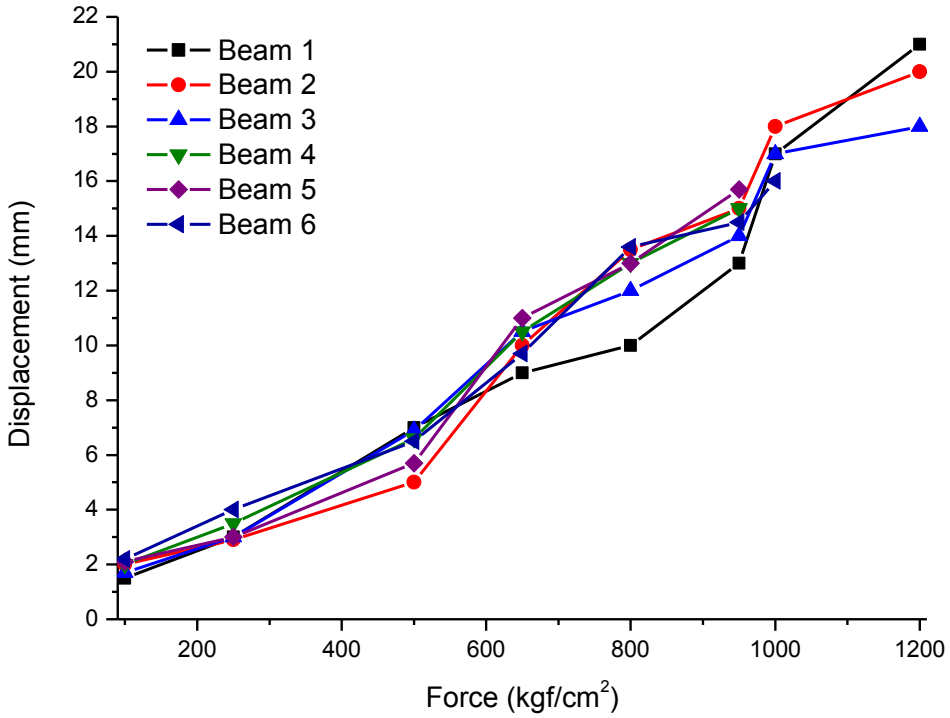


Fig. 6 Type B - the dependence between the force and the displacement of the beam

From this dependence we can see that type B reinforcement is more resistant than type A reinforcement. This is happened due to the overlapping of several types of beams with different grade of resistance so the final reinforcement type becomes more efficient in operation because of the two GFRP fabrics and also because the types of wood essences.

As we can see the beams have the same behavior until 700kgf/cm2 and then appear differences between their behaviors. This is because of the GFRP fabrics and also because of the internal wood fibers which are not continuous or they have any stress concentrators.

Conclusions

This paper presents the experimental part of the bending test performed on two types of wood beams reinforced with GFRP fabrics and glued with epoxy resin.

The test reveals that the type of reinforcement give us information about the maximum displacement and maximum bending resistance. From the obtained results in the tests we can say that the type B reinforcement give us important information about how is better to design a wood beam reinforcement for depending where we need to be utilized.

References

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