The Effect of Carbon Fiber on the Shear Capacity of a Bolt Within a Lap Joint

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The basis of this project is on a structural component known as a lap joint. Lap joints can be conjoined with bolts to connect two plates of metal together. Forces can be applied to the system which could eventually cause the bolt within the joint to shear. In many cases within a lap joint, the bolt is likely the weakest component of the system. This is the reason for the carbon fiber. Carbon fiber is an extremely strong material that is becoming more prevalent in engineering design features. This project utilizes carbon fiber within a lap joint, to increase the amount of force that the system as a whole can support. Carbon fiber was used to reinforce the bolt in the lap joint, and to share the load with the bolt. In order for this to be effective, it was vital that the carbon fiber was in tension when the force was applied upon the bolt within the lap joint. In order to do this, the fiber was tied between two eye bolts, after which the bolts were pulled apart slightly to allow for the fiber be in tension and to share the load with the bolt. The fiber was successful in adding significant strength to the system, and more than doubled the force it supported. However, based on the analysis of the video on the experiment, and based on the data produced, a better system could be created that would be more controlled. Below is a drawing of a future idea that would ensure less amount of variability within testing. The ideas of this project could be applied to structures such as bridges or buildings. Carbon fiber can be used to strengthen a conjointment of two structural components. It might also be used in a way to reduce cost within a bridge project, all while keeping the same strength.

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