

Design and Analysis of Honeycomb Sandwich Panels for Boat-Result and Discussion

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Abstract— Aluminum Honeycomb Panel is flat and has excellent rigidity. The core layer is the hexagonal aluminum honeycomb, adhered to the face plate and the sole plate by adhesive glue. The diversionary honeycombs can bear the pressure coming from the plates which provide the superior flat and rigidity, if the plates are very large. The panels are light weight and saves energy. Under 1/5th, 1/6th and 1/7th weight of wooden board, glass and aluminum in the same volume that reduce the cost of transportation and energy and at the same time making installation very easy. The Aluminum Honeycomb Panel is good for the environment as it is free from release of harmful gases and is easy to clean and recycle. The product is moisture proof and it is coated with PVDF paint which enables the color to be durable and free from mildew and deformation in damp environments. From high performance off-shore racers to the recreational run about, honeycomb composite panels have superior strength-to-weight ratios, better toughness, and moisture and corrosion resistance for demanding applications.

Key words: Boat, Aluminum honeycomb panel

strength has been exceeded. Unlike some competitive core materials the immediate loss of function does not occur. Thus, we are proposing the use of honeycomb material in marine applications over the regular aluminum sheets.

To replace the existing aluminum sheet from the body of small boats with the Aluminum honeycomb panel of equivalent strength so as to reduce the weight of the structure without compromising the strength.

A. Objectives of Project are:

- To reduce the weight of the boat.
- To increase the strength of the boat.
- Increased performance.
- Increased payload capacity.
- To reduce the cost of the boat.

II. CAD MODELLING

The CAD modeling of 1 inch thick Aluminum honeycomb boat is carried out in solidworks software.

I. INTRODUCTION

That critical qualities are must have for hulls, decks, bulkheads, and more. Low density option matched with superior mechanical properties make honeycomb core products more desirable than traditional balsa wood and foam products, it has high strength and stiffness characteristics during regular loading conditions, the shear failure mode of honeycomb allow it to continue the function after its yield

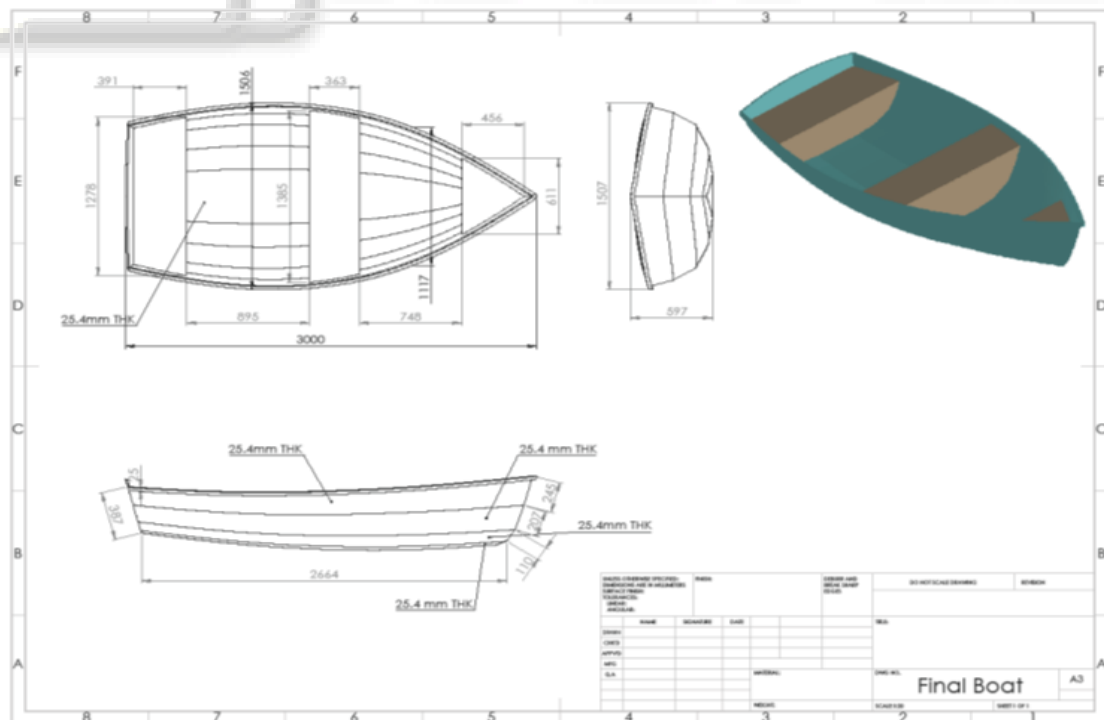
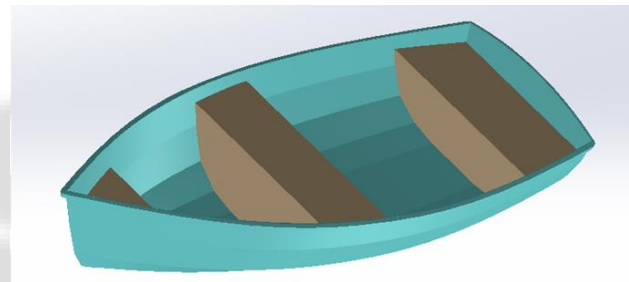


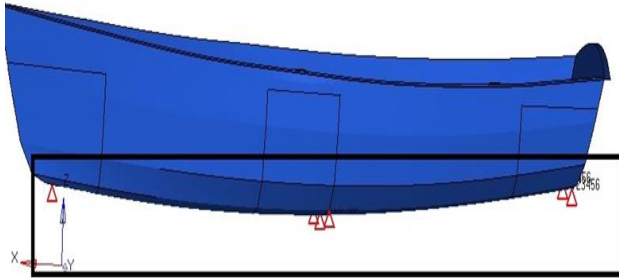
Fig. 1: Detail drawing of 1 inch thick Aluminum honeycomb boat.

III. ANALYSIS

Assuming that boat can carry 4 person at a time)

- Weight of passenger = $4 \times 100 = 400\text{Kg}$
- Mass of the boat = volume * density of aluminum = 132kg
- Total weight = $400 + 132 = 532\text{kg}$
- Total force acting = $532 \times 9.81 = 5218.92$

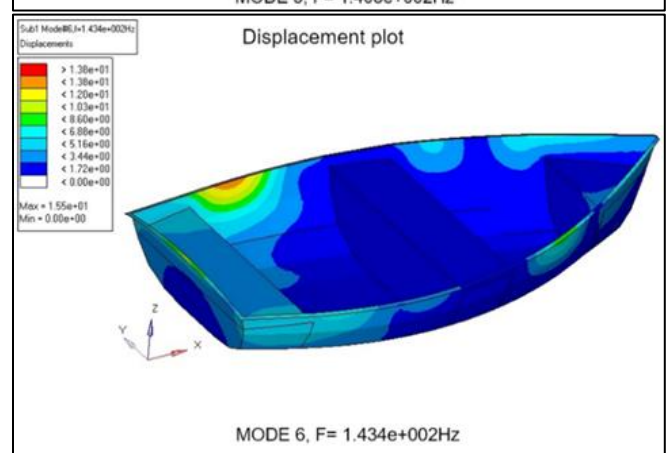
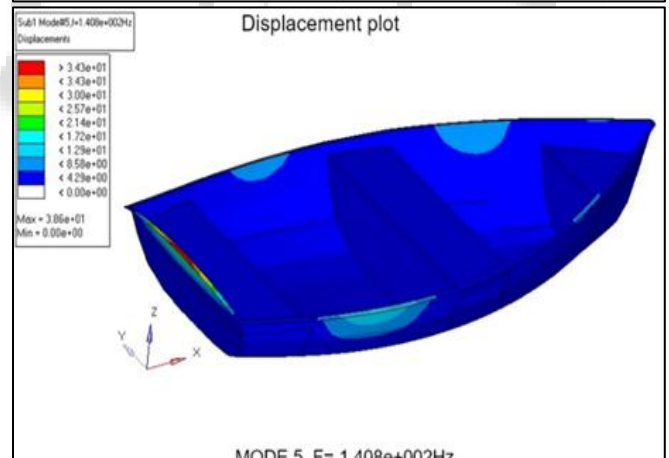
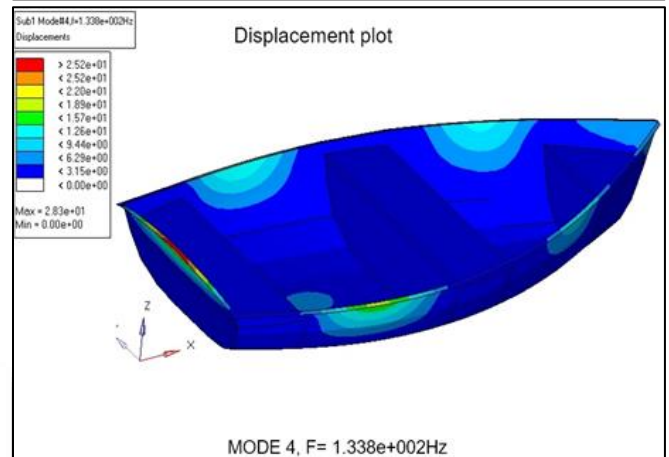
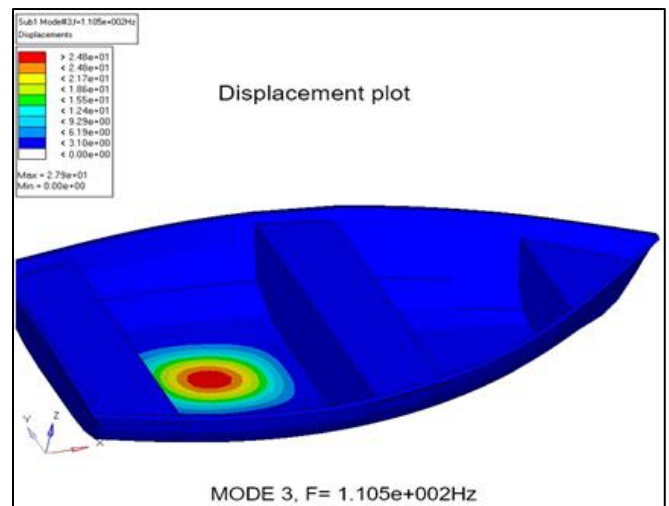
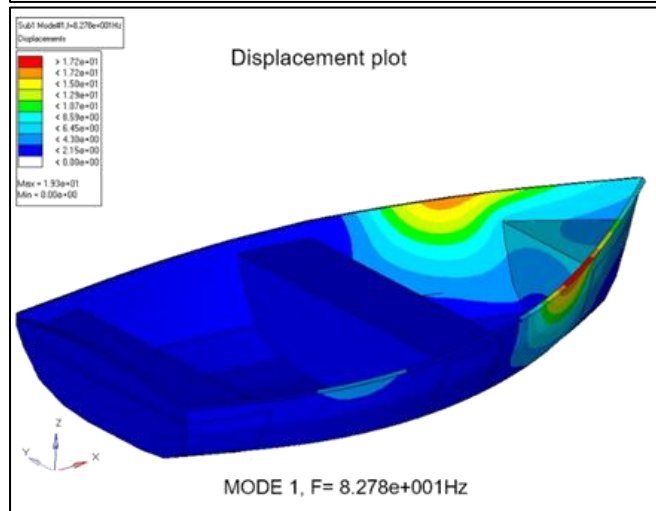
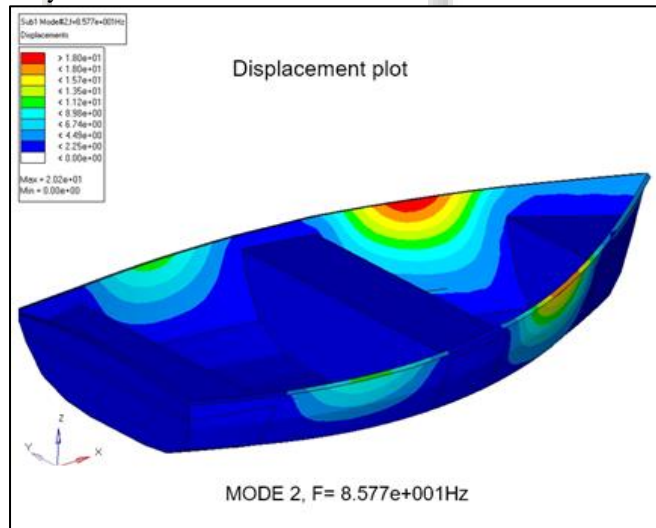
A. Boundary Condition:



The boat is supported from the bottom as in the case of water, thus the bottom of the boat is constrained.

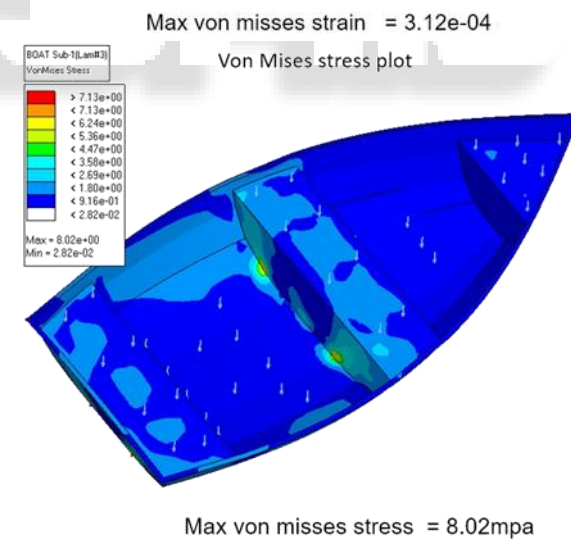
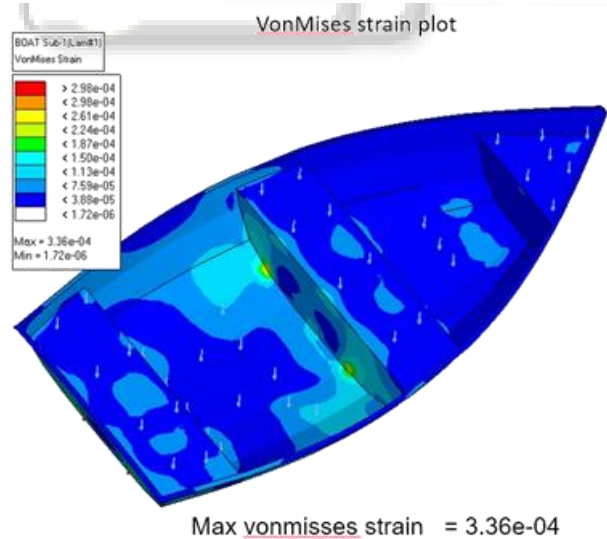
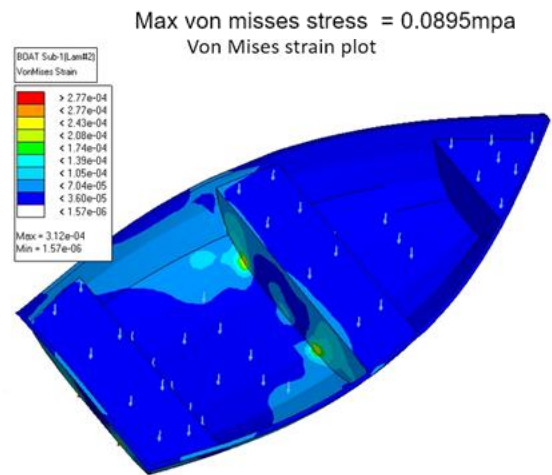
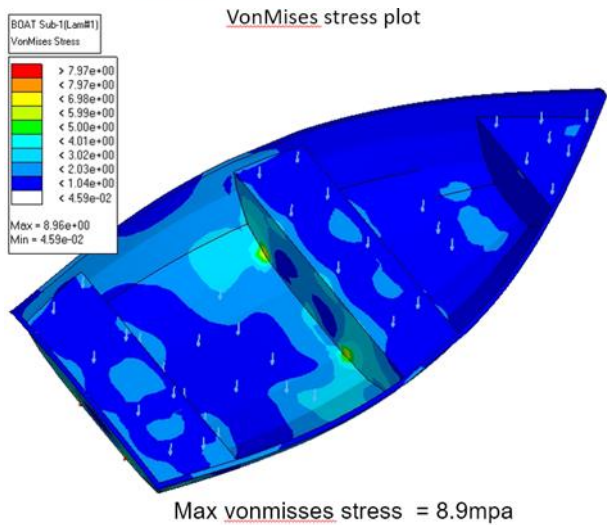
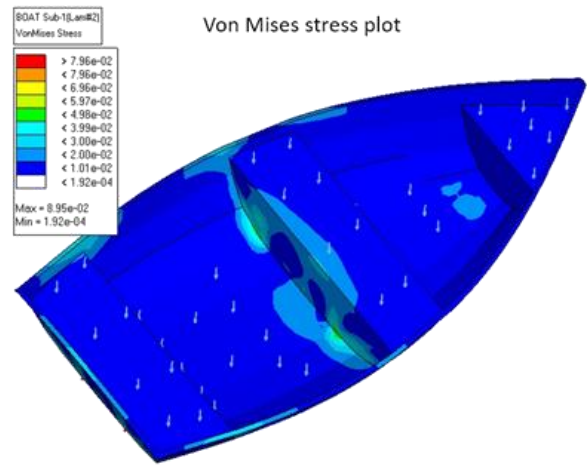
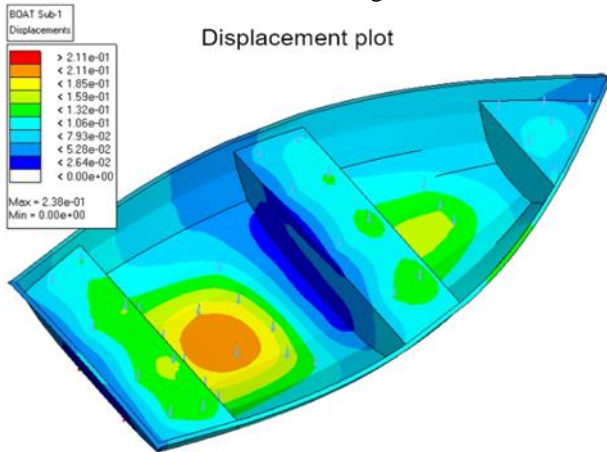
B. F.E Results (Modal):

Modal analysis is performed on the boat to understand the stiffness of boat in different directions, and also at avoid rigid body modes.



IV. F.E RESULTS (STATIC)

Linear static analysis is performed on the Honeycomb panel boat to find out induced stresses for given loads.



A. Modification:

As the stresses in 1 inch thick Aluminum honeycomb boat is very less (12Mpa), it can be further reduced to 0.5 inch thick Aluminum honeycomb panel to reduce the weight further.

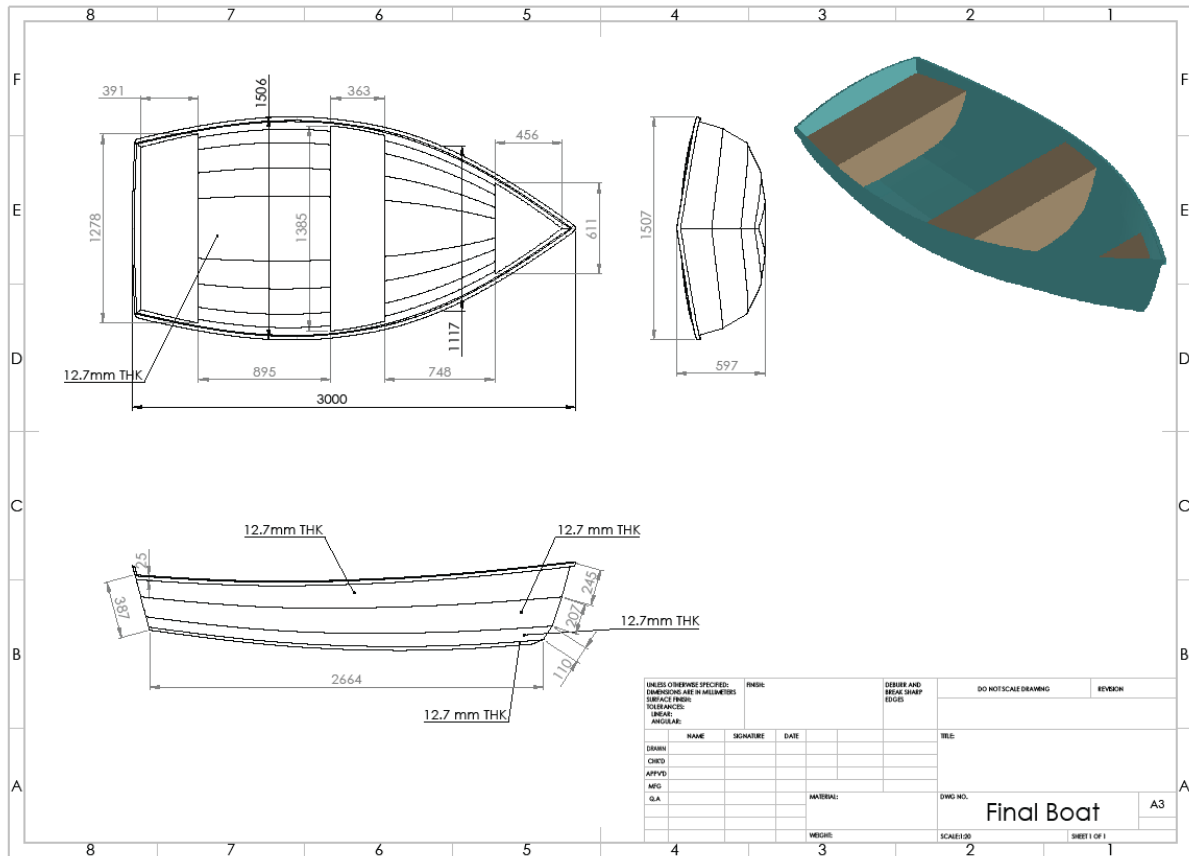
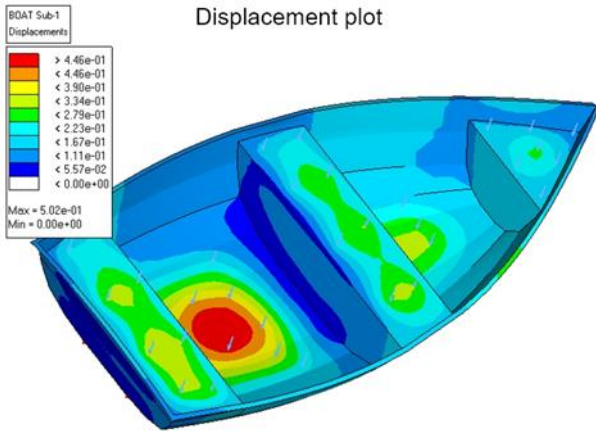


Fig. 2: Detail drawing of 0.5 inch thick Aluminum honeycomb boat.

V. F.E RESULTS (STATIC)

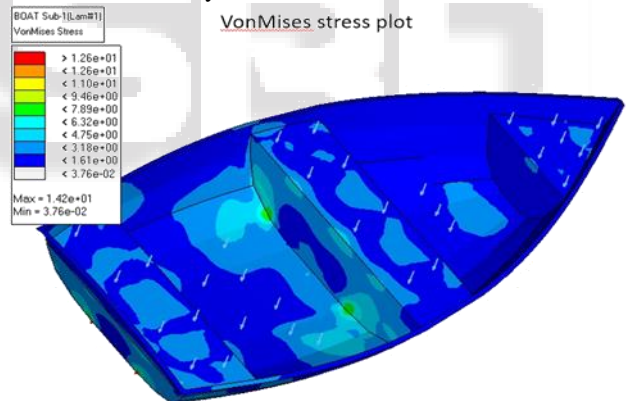
Linear static analysis is performed on the Honeycomb panel boat to find out induced stresses for given loads.

Displacement plot



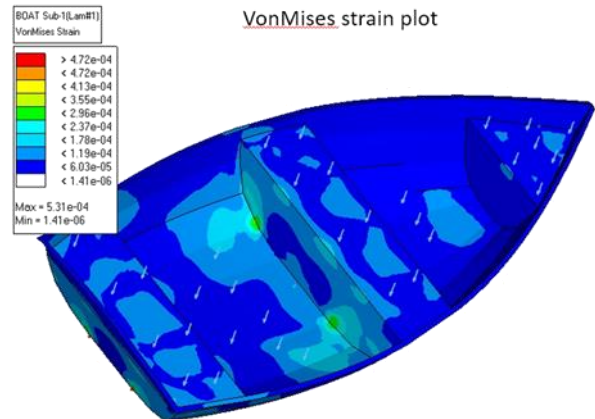
Max. Displacement = 0.5mm

VonMises stress plot

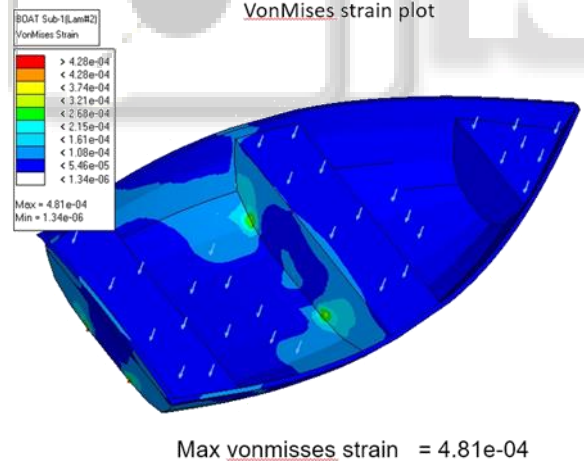
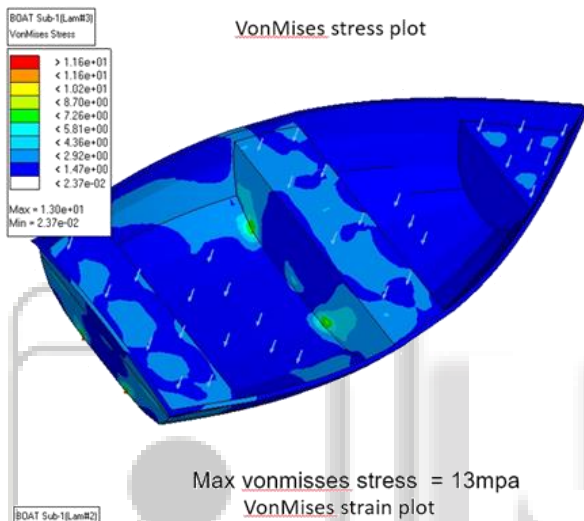
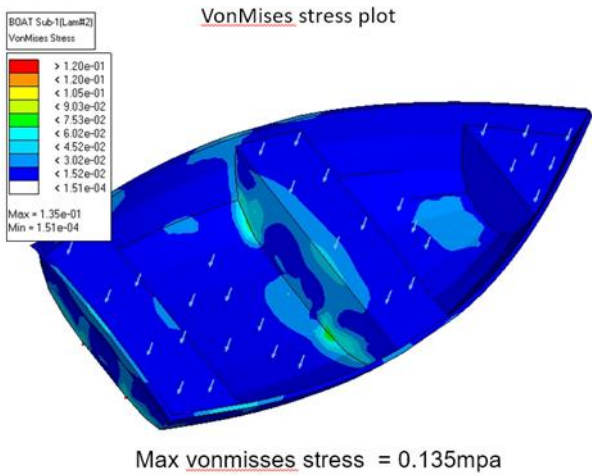


Max vonmises stress = 14mpa

VonMises strain plot



Max vonmises strain = 5.31e-04



VI. CONCLUSIONS

Thus in this project, we have proposed to replace the existing aluminum sheet used in the body of small boats with the Aluminum honeycomb panel of equivalent strength so as to reduce the weight of the structure without compromising the strength.

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