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STRESS AND FATIGUE ANALYSIS ON SANDWICH PANELS BY USING ANSYS

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Abstract - *Sandwich boards are generally utilized in aviation and other designing applications. The strength of sandwich boards relies upon the middle utilized in development. The basic cross segment applied to the focal point of the honeycomb is hexagonal calculation. The motivation behind this construction is to investigate the potential outcomes of various cross-areas for the focal structure. The roundabout, hexagonal and square sort cross- area for the middle is viewed as concentrated with a mix of various materials. Material Additives Steel - AL6061 Core, AL6061 - AL5052 Core and AL6061 - Thermoplastic Polyurethane Core. Number re-enactment is done utilizing ANSYS. Standard underlying examination and weariness life appraisal is performed utilizing the ANSYS workspace. 3D demonstrating of math and gathering is done at SolidWorks. Stress focus is utilized in center and exhaust life to comprehend the conduct of sandwich boards. Gerber's hypothesis is utilized on the grounds that it is utilized to tackle a drained life Ease of Use.*

***Key words*: Sandwich boards, Polyurethane, Square, construction, Additives Steel.**

1. INTRODUCTION

Sandwich boards (here and there called composite boards or Primary protecting boards (SIP)) Comprise of two layers of Sticky material fortified on one or the other side of the lightweight Center. Every one of the three segments cooperate; That is, the Blend of segments gives Preferred execution over Conceivable whenever worked alone. The lightweight center keeps both Faces in amazing position, opposes cutting powers and gives Protection, while the two Countenances give solidness, climate and Sway opposition and forestall airborne powers of strain And Withdrawal.

2. HISTORY AND DEVELOPMENT:

Blended cladding frameworks have been in need for quite a while, particularly for the Assembling of vehicles like trains and planes, yet the improvement of refined sandwich boards For cladding structures initially started during the 1930s and was utilized by designers including The Forest Production Laboratory., And Frank Lloyd Wright, when explored by such Associations. They turned out to be exceptionally mainstream after World War II. Present day Sandwich boards are level, bended, bended and mixed into practically limitless setups and are Accessible in an assortment of tones, results, thicknesses, edge subtleties and profiles relying Upon execution necessities. They are by and large off-site manufactured and are successful where High primary strength, undeniable level protection and high execution cladding with low weight Are required.

Types of materials used in sandwich panels:

The external essences of sandwich boards are most normally made of metals, for example,

- Hot-plunge electrifies steel sheet.
- Aluminum.
- Zinc.

Nonetheless, different materials that can be utilized include:

- Precast cement, now and then clad with different completes like block.
- Cement board.
- Glass fiber built up polypropylene.
- Poly vinyl chloride (PVC).
- Magnesium oxide board (MgO).
- Plywood.
- Oriented strand board (OSB).
- Glass built up plastic (GRP).

Choosing materials :

We choosing our models constrain materials are

- Aluminium 6061 T6
- Aluminium 5052
- Thermoplastic Polyurethane

Properties:

Sandwich boards can be chosen in view of their:

- Ease and speed of establishment.
- Rigidity.
- Thermal, fire and sound protection.
- Airtightness
- Robustness and sturdiness
- Low upkeep/cleaning necessities.
- Low capital expense.
- Low lifetime costs
- Chemical and natural obstruction
- Light weight.
- Weather obstruction.
- Dimensional soundness.

Application of sandwich panels:

- Factories
- Commercial showrooms and offices
- Warehouses
- Distribution Centers
- Aircraft Hangers and enclosed Sports

Facilities

- Restaurants and Schools
- Airport Terminals
- Museums and Theaters
- Shopping Malls and
- Supermarkets/Hypermarkets
- Interior wall Partition

3. ANALYSIS OF STRESS AND FATIUGE :

AL 6061 T6 properties:

❖Density – 2.7E-6 Kg/mm3

❖Youngs modulus – 68900 MPa

❖Poisson's ratio – 0.33

❖Ultimate rigidity: 310 MPa

❖ Honey brush structure: Circular, Hexagonal, Square

❖Load : 5000 Kgf or 49050 N.

Roundabout Honey brush center:

- Top and Base plate : Structural steel
- Core : AL 6061 – T6
- Applied Load – 5000 Kgf

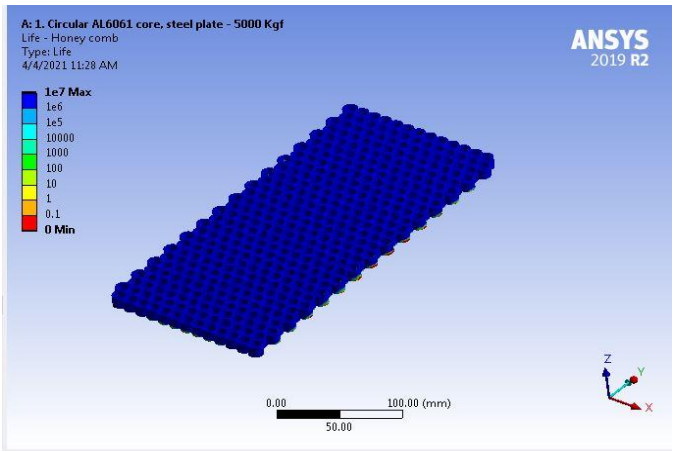

Fig-1: Equivalent stress on core

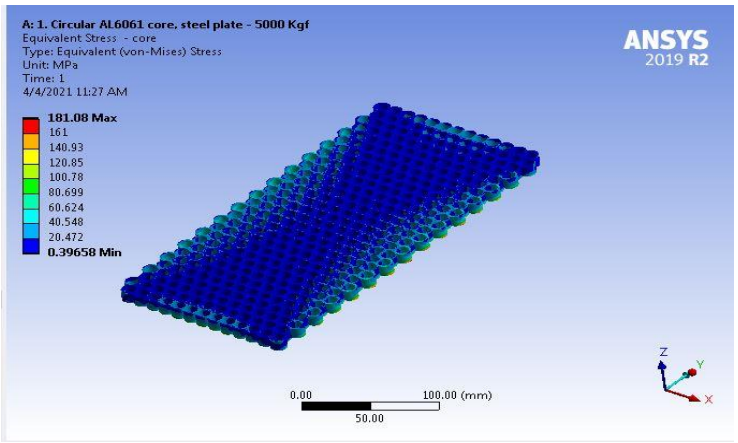

Fig-2: Fatigue life for the core

Observations:

The Aluminium AL 6061 core has maximum stress value of 181 MPa on the edges and Its yield strength is 276 MPa. Overall distribution of stresses from the contour indicates a Value Of 60 MPa. This contributes higher fatigue life to the Circular core with a value of 1E7 cycles as Given by the life Contour.

AL 5052 properties:

❖ Density – 2.6E-6 Kg/mm3

❖ Youngs modulus – 70300 MPa

❖ Poisson's proportion – 0.33

❖ Ultimate tensile strength: 193 MPa

❖ Honey comb structure: Circular, Hexagonal, Square

❖ Load : 5000 Kgf or 49050 N

Hexagonal Honey comb core:

❖Top and Base plate : Structural steel

❖Core : AL 6061 T6

❖Applied Load – 5000 Kgf

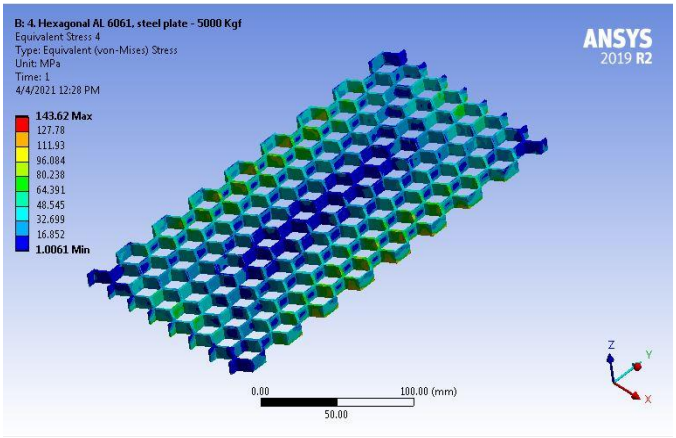

Fig-3: Equivalent stress on core

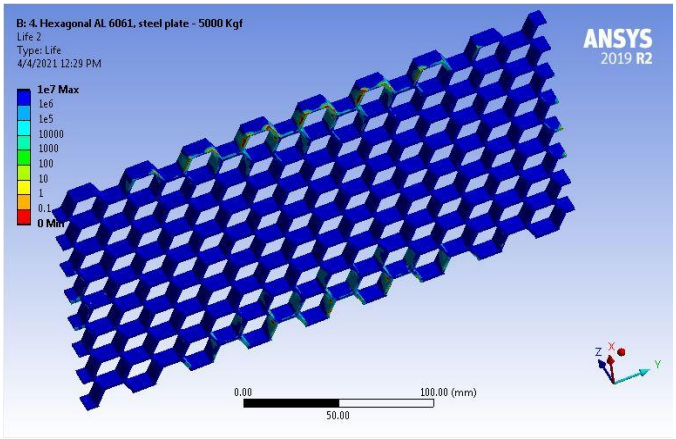

Fig-4: Fatigue life for the core

Observation:

The Aluminium AL 6061 core has maximum stress value of 143 MPa on the edges and Its yield strength is 276 MPa. Overall distribution of stresses from the contour indicates a value Of 60 MPa. This contributes higher fatigue life to the circular core with a value of 1E7 cycles as Given by the life contour.

Thermoplastic Polyurethane properties:

❖Density – 1.28E-6 Kg/mm3

❖Youngs modulus – 500 MPa

❖Poisson's proportion – 0.48

❖Ultimate elasticity: 20.7 MPa

❖Load : 1000 kgf or 9810 N.

Square Honey brush center:

❖Top and Base plate : Structural steel.

❖Core : AL 6061 – T6.

❖Applied Load – 5000 Kgf.

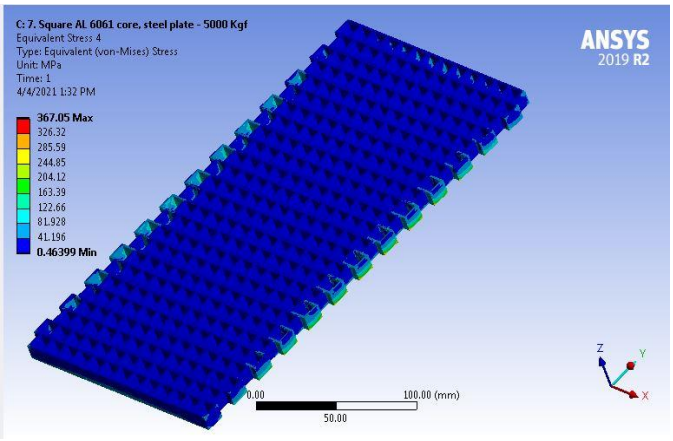

Fig-5: Equivalent stress on core

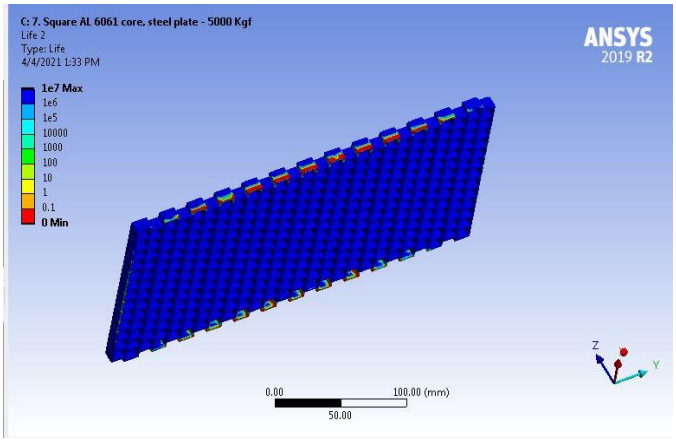

Fig-6: Fatigue life for the core

Observation:

The Aluminium AL 6061 core has maximum stress value of 143 MPa on the edges and its yield strength is 276 MPa. Overall distribution of stresses from the contour indicates a value of 60 MPa. This contributes higher fatigue life to the circular core with a value of 1E7 cycles as given by the life contour.

Result:

Construction	Maximum stress(mpa)	Average stress (MPa)	Fatigue life (cycles)
Circular cross section core			
Steel – AL 6061	181	60	1E7
AL 6061 – AL 5052	264	59	1E7
AL 6061 – Thermoplastic PU	7.6	3	1E5
Hexagonal cross section core			
Steel – AL 6061	143	48	1E7
AL 6061 – AL 5052	196	45	1E7
AL 6061 – Thermoplastic PU	9	4	1E5
Square cross section core			
Steel – AL 6061	364	80	1E7
AL 6061 – AL 5052	591	66	1E7
AL 6061 – Thermoplastic PU	10	4	1E5

Chart -1: Result

4. CONCULUSION:

The stress and fatigue study for sandwich Panels were carried out using ANSYS Tool. The table shows that the overall Fatigue life remains same across different Cross section for Honey comb core. This Behavior is applicable for all material Combinations used in this study. However the hexagonal cross section core has the Minimum stress levels for the same Boundary Conditions for all material Combinations. This study reveals that Hexagonal honey comb Structure is most suited for sandwich construction.

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