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DESIGN AND ANALYSIS OF ALUMINIUM HONEYCOMB MATERIAL FOR INTERNAL WALL OF BUILDING

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***Abstract*— Aluminium Honeycomb Material Design is the process of designing of the wall for replacing the conventional wall to the aluminium honeycomb wall. It is refers to the process of Design and Analysis of Aluminium honeycomb material for the internal wall. In this paper, the technique presented is replacement of conventional wall to this wall. The design of wall is doing by using the Catia software and analysis by Ansys software. The calculation is doing by using some formulae. The wall have a good strength, high impact resistance, high durability, and it give the require strength in minimum thickness also this wall is portable. The wall has another properties like fire resistance, corrosion resistance, & Sustain very large amount of load.**

***Index Terms*— Reduce the wall thickness, reduce the overall weight of building, Make wall portable, Alter the floor area as per requirement, and increase the usable carpet area of building.**

I. INTRODUCTION

Aluminium honeycomb material is a sandwich material made by joining aluminium sheet with core. This core is hexagonal shape cells which join each other at the same pattern. The outer diameter of this cells is 6.25mm. This hexagon are join to each other make structure look like honeycomb. This core material is join with two aluminium face sheet by using adhesives. The thickness of face sheets are 1mm to 2mm. the face sheets are sandwich the core material by use of adhesives.

The wall panels are available in the market in standard format like 5mm, 10mm, 15mm and 20mm. this panels are join by using fixtures and fastening which can be remove easily for altering the wall. The panels are 3m x 3m in the market which is sell per Sq.ft.

This panels are very light weight so it can be handle and move easily because of light weight the overall weight of building is reduce. This panels are gives required strength in minimum thickness so use of this panels carpet area of building is increase.

Calculations are doing by using deformation formula of concrete. The thickness find out by correlate this formula with aluminium properties. Design has done after the thickness is found out. After design done the analysis part processed. And finally the result compared with conventional wall.

This panels use before in the aerospace industries for making wings of the planes. Also it is used in the mechanical industry for making the coaches of trains, for doors, for chassis of the cars, because of high strength, low weight, and high durability, also it has properties like fire resistance, highly impact resistance, it resist the corrosion so it can be use anywhere where the use of water is maximum. This is use as floor in the construction industry, also for partition walls, and compound wall of building. Due to above properties it can be used in the internal wall of the building for increasing area, reduce overall weight.

II. LOAD CALCULATIONS

Critical load (PO): Maximum bending moment for the simply supported honeycomb beam (M) = pa/4 We know bending moment equation i.e.

$$M/I= E/R= \sigma/Y$$

Where,

M=maximum bending moment,
I= area moment of inertia of the beam vertical c/s
E= modulus of elasticity of Aluminium
σ = bending stress
Y=distance of any fiber from neutral axis

Critical load is the load at which bending stress is equal to yield stress

Then σ = σf,
From equation (11), M/I=σf/Y
M= σf (I/Y)= σf(Z),

Where,

Z=section modulus,
I= bh^3/12=100(18.7)3/12 mm^4
Y= h/2=18.7/2=9.35 mm
Z= I/Y=5826.2 mm^2
Pa/4= 268(5826.2)
P(500/4)= 268(5826.2)

P= 12588.8N=12.6 KN

Therefore critical load is obtained as 12.6 KN Mass of the A1 rod of the given dimensions.

Mass=a.b.h.o=500(100)(18.7)(2.7)1000=2524.5g=2.52 Kg

Therefore weight of the specimen=2.52*9.81=24.76 N

Strength to weight ratio= 12.6(1000)/24.76=510

I= Strength to weight ratio of aluminium honeycomb panel.

III. THICKNESS CALCULATIONS

Wall is simply supported beam with Uniformly Distributed Load. So, for find the thickness of Aluminium honeycomb

Deformation-

=5We^4/384EI

Wall Details-

Total loads=13876.4 N=13.87 KN

So we take approximate dimension

L=3.679 m, b=1.579 m, h=0.05 m

So E for wall composite steel as per analysis

E=200000 MPa

So,

I= bh^3/12= (1.579*0.05^3)/12

= 1.6447*10^-5 m^4

So,

= (5*13876.4*(3.679)^4)/(384*200000*(1.6447*10^-5))

= 12704.73/1263.2 = 10.05 m

For Aluminium honeycomb

So for thickness and E=34000 MPa

10.05=(5*13876.4*(3.679)^4)/(384*34000*I)

I=0.009687

Bh^3/12=0.009687

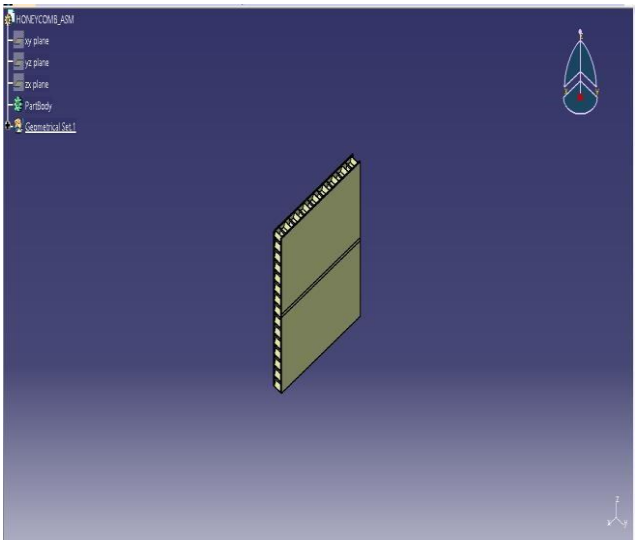
H^3=0.07361 m

H=9.03 mm

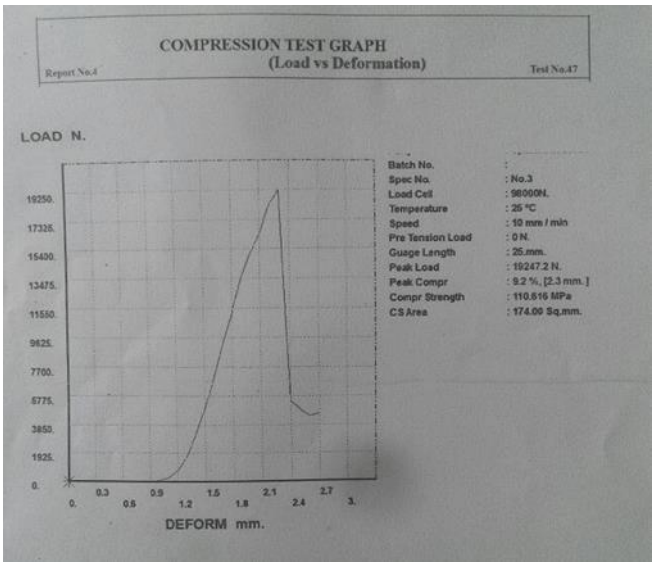
So the thickness for aluminium honey comb wall is (9.03=10 mm)……For standard and safe.

IV. EXPERIMENTAL RESULTS

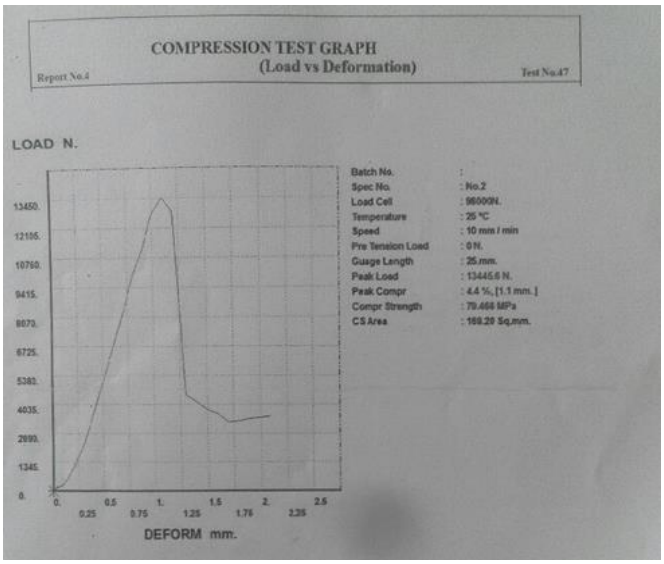
Design plate is shown below



The small side of plate is vertical side and Large side of the plate is horizontal side.The compression tests done on the plates. Below graph shows the various testing results conducted on aluminium honeycomb plates.



Vertical Compression



Horizontal Compression

V. CONCLUSION

We have implemented an aluminium honeycomb material for internal walls of building. Our wall is successfully pass the all test which required for the walls. We successfully reduce the thickness of wall and maintain the strength of wall as conventional wall.

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