ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Design and Analysis of Bus Body Superstructure

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ABSTRACT

Buses are the main mode of public transportation. The layout of the bus body relies upon in large part upon the performance requirements beneath various sorts of loading, running situations and the road situations. The structural layout additionally varies on the idea of the passenger capacity, the styles of utilization, and the nature of operation: city/rural, longer term/metropolis run and many others. Based on above necessities the structural substances, the size and form of the structural member, the joint designs and so on., are selected. In India, most of the buses are designed and fabricated on the idea of past revel in.

The 3-d model of bus body superstructure is prepared with the useful resource of the use of Pro E software program and structure and modal assessment completed by manner of ansys paintings bench. At present evaluating the power and vibration in Bus Body Superstructure at precise places with everyday static load. Finite Element modelling of a Bus body form described for finding the assessment of vibration/stress ranges at exclusive places of the auto.

The strain, deformation are obtained for distinct materials of bus superstructure at cant rail and waist rail.

I. INTRODUCTION OF BUS BODY SUPER STRUCTURE

Our society's increasing necessities for mobility with concurrently growing environmental sensitivity is a big challenge for the site visitors policy makers and the transport groups consisting of private fleet operators. Consequently, it's also fundamental for the manufacturers of mild and heavy passenger automobiles and the frame developers to evolve to the ecologically motivated requirements, which turns into increasingly vital without compromising on basic minimum necessities of protection and luxury. The CMVR - Technical Standing Committee, addressed the trouble regions and the entire workout became aimed in the direction of standardizing the important components concerned within the construction of the bus frame considering the minimal necessities of Safety and Comfort for a passenger. The finalized " Code of Practice for Bus Body Design and Approval " changed into submitted to the Ministry for similarly vital motion. The preferred AIS-052 turned into published in September 2001.

Cite this article as: A.Baba, C.Ramamohan Naidu & C.Raghunatha Reddy " Design and Analysis of Bus Body Superstructure", International Journal & Magazine of Engineering, Technology, Management and Research (IJMETMR), ISSN 2348-4845, Volume 7 Issue 10, October 2020, Page 1-7.

ISSN No: 2348-4845
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It become noticed that the OE car manufacturers sell their merchandise inside the form of drive away chassis and the body design and constructing is being executed through manner facet body developers who rent bad layout, negative exceptional merchandise, spurious substances and elements, with no uniformity within the construction, ensuing in big amounts of fatal accidents. The existing bus body systems are hardly design most desirable and secure. The cabin and seats have cramped designs which do now not offer safety and comfort to the driver. Body designs provide intense warmness, vibration, noise, negative consolation and safety. Wood is being used in the creation of the body to a massive volume. Of overdue some reputed body developers have delivered in progressed bus designs inside the marketplace but still plenty must be achieved.

II. LITERATURE REVIEW

Prasana Priya .Chinta has [1]designed bus body structure in such away that to reduce the variety of factors from the structure in addition to thickness closer to weight reduction of bus structure. Optimization of mechanical response of automobile and body designs are increasingly more is predicated on new models. Generally in global market for passenger's buses layout strategies can rely upon supercomputing facilities. Nowadays for [2]the passenger buses have many local producers which assemble motors based on neighborhood needs. In the competitive to live these producers follow the equal necessities and weight loss of their international counterparts with out get right of entry to to latest computation facilities. This paper proposes a new technique for designing a bus body structure is designed and modeled in three-D modeling software program Pro/Engineer. [3]The authentic body is redesigned by way of changing the thickness and decreasing the range of elements in order that the total weight of the bus is reduced. The gift used cloth for shape is steel. It is changed with composite materials Kevlar and S 2 Glass Epoxy. The density of metallic is greater than that of composite []materials, so by means of replacing with composites, the burden of the shape is decreased. Structural and Dynamic evaluation is done on both the systems using three materials to determine the energy of the shape. Analysis is performed in Ansys.[5]

Glass fibre:

Glass fibre is a material inclusive of severa extraordinarily quality fibres of glass. Glass fibre is typically used as an insulating cloth. Glass fibre reinforcement offers excessive tensile energy, high elasticity and awesome dimensional balance. It is used with all most important resins for products which include plane and missile parts, trays, electrical additives, motor body components and constructing panels.

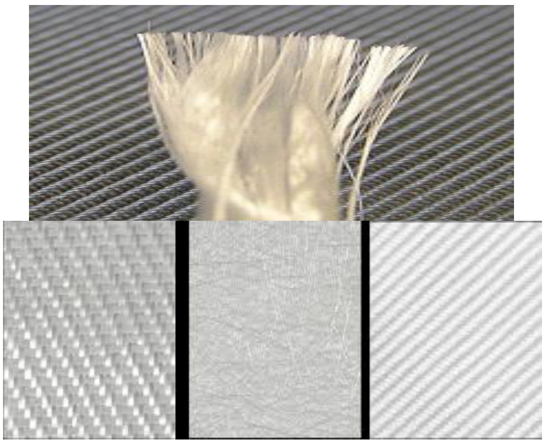

Fig 3.1: Different forms of glass fibres

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Material Properties:

Properties	E-Glass	Carbon epoxy	Stainless steel
Young's Modulus (GPa)	72.5	388	193
Poisson's Ratio	0.28	0.358	0.31
Density (kg/m³)	2580	1600	7750
Tensile Strength (GPa)	3.45	4.1	3.2

Table 3.1 Properties of Material

Building of Bus structure the commands used are 1.Extrud

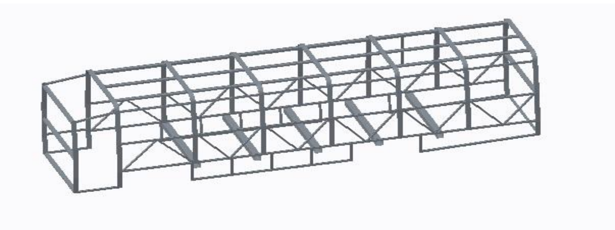

Fig 1:3D Model created in Pro/Engineer Software

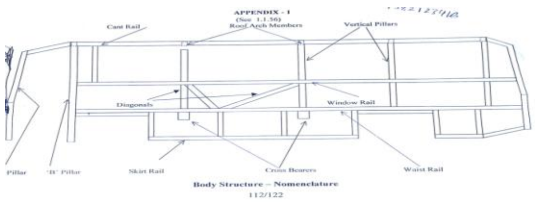

Fig.2 Nomenclature of the Bus Superstructure

III. ANALSYS

Five Load Calculation

For cant rail: Weight has taken the roof structure of the bus is 21000 N, Mass is considered the 7 roof arch participants as given the statistics in Table 5.1and Table five.2, it's far shared by means of two cant rails of the bus.

For Waist Rail: Weight has taken the only side either L.H.S or R.H.S is as follows.

1.Half of the roof shape weight.

2. 7 Pillars weight, cant rail, window rail ,waist rail and 12 ribs weight.

Load Applied on parts of Bus	Weight(N)		
	Total Load	L.H.S	R.H.S
Cant Rail	21000	10500	10500
Waist Rail	37000	18500	18500

Table 5.3:Laod Application Table

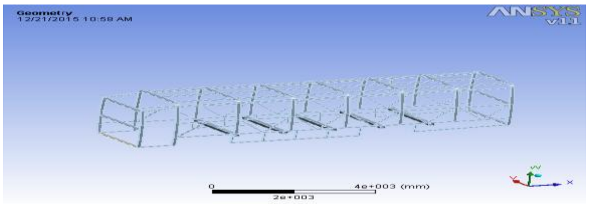

Fig1 Geometry of the Bus Body Super Structure

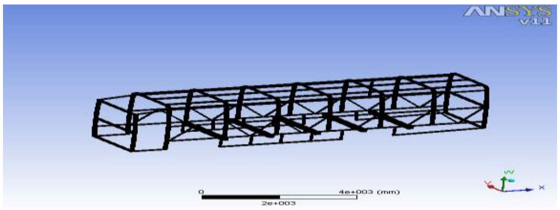

Fig2:Mesh generation

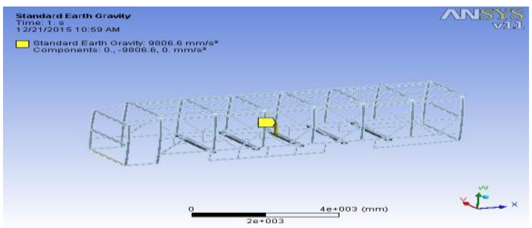

Fig3:Stand by earth gravity

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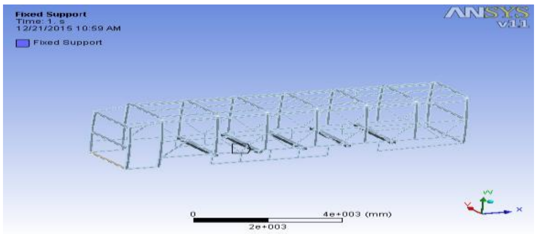

Fig4:Cross bearers are taken as Fixed support

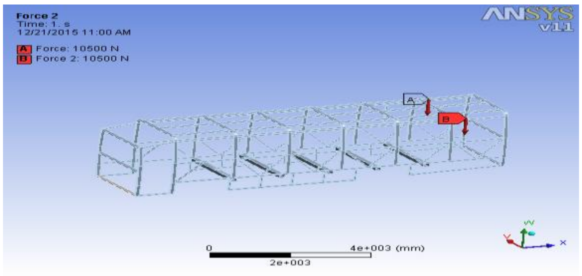

Fig5:Force is applied on cant rail

For CARBAN FIBRE

Young's Modules	: $3.88X10^5$ Mpa
Positions Ratio	: 0.358
Density	:$1.6X10^{-006}Kg/mm^3$

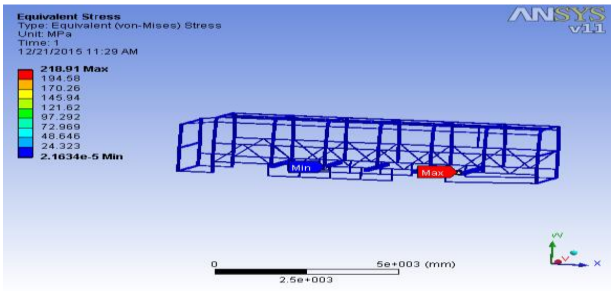

Fig6:Equivalent stress developed is 218.91 Mpa at 10500 N load applied On cant rail

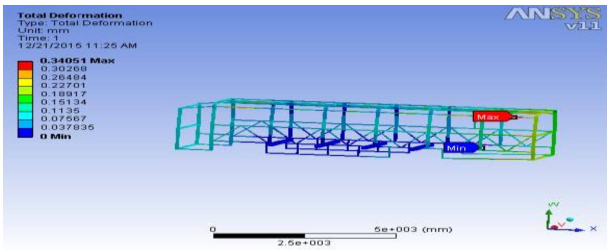

Fig7:Max deformation is 0.34051mm when 10500N load is applied on cant rail

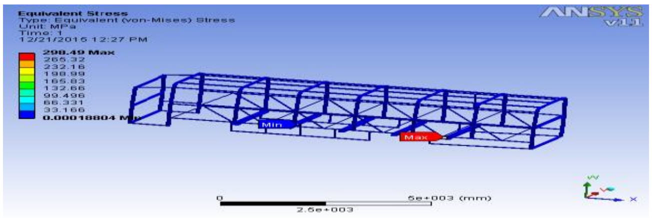

Fig8:Equivalent stress developed is 298.49 Mpa at 18500 N load applied On waist rail

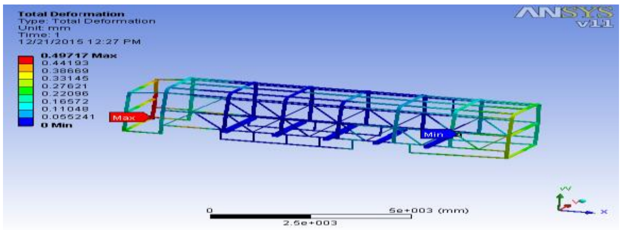

Fig9:Max Deformation is 0.49717mm when load is 18500N applied on waist rail

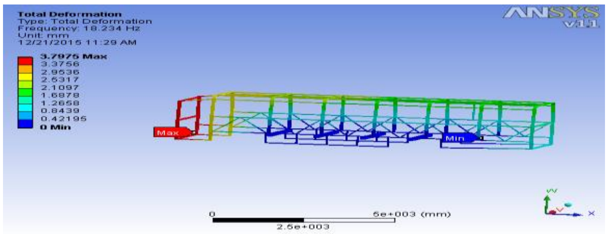

Fig10:Mode1: Max deflection is 3.7975 mm when the frequency is 18.234 Hz

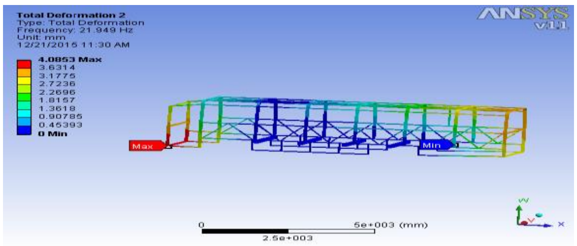

Fig 11:Mode 2: Max deflection is 4.0853 mm when the frequency is 21.949 Hz

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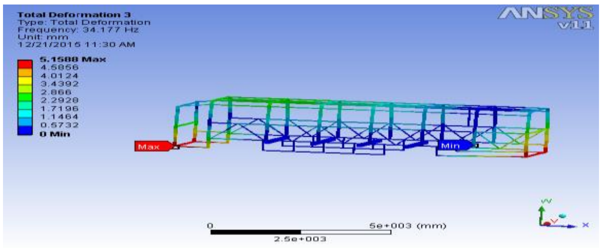

E-GLASS

Young's Modules : 72500Mpa
Positions Ratio : 0.28
Density : 2.58×10^{-006} kg/mm^3

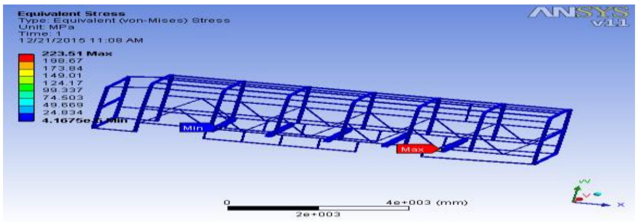

Fig16: Equivalent stress developed is 223.51 Mpa at 10500 N load applied On cant rail

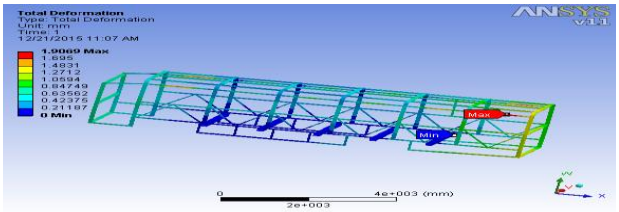

Fig17:Max deformation is 1.9069 mm at 10500 N load applied on cant rail

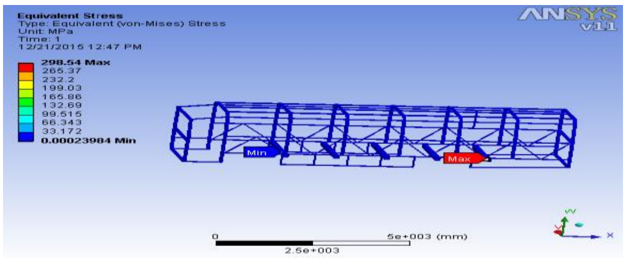

Fig18:Equivalent stress developed is 298.54 Mpa at 18500 N Load applied on waist rail

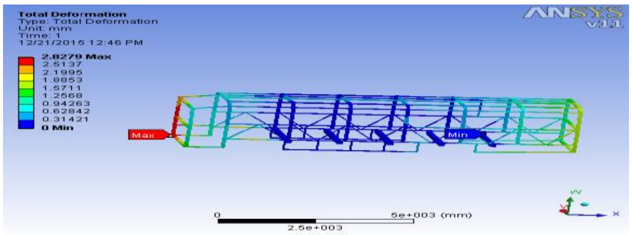

Fig19:Max Deformation is 2.8279 mm at 18500N load applied on waist rail

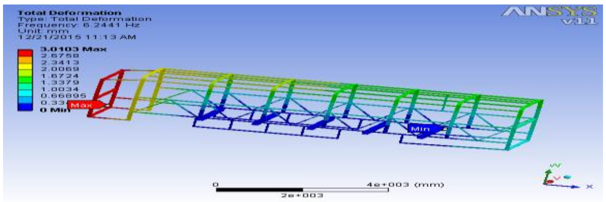

Fig20:Mode 1: Max deflection is 3.0103 mm when the frequency is 6.2441 Hz

Structural steel

Young's Modules : 1.95×10^5 Mpa
Positions Ratio : 0.31
Density 7.750×10^{-006} Kg/mm^3

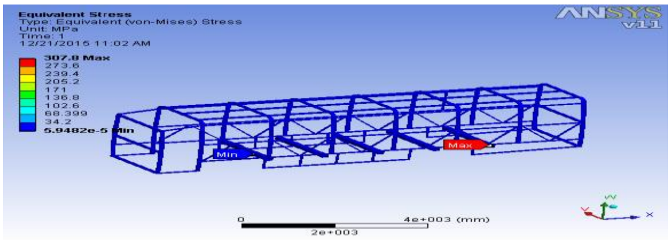

Fig26:Equivalent stress developed is 307.8 Mpa at 10500 N load applied On cant rail

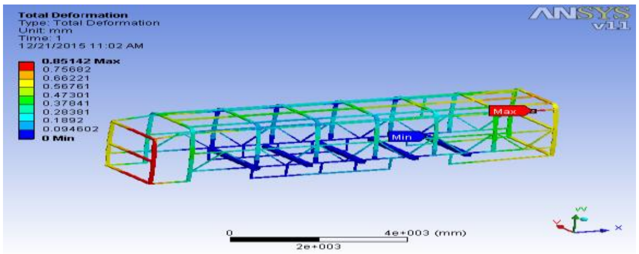

Fig27:Max deformation is 0.85142 mm when load is 10500N applied on cat rail

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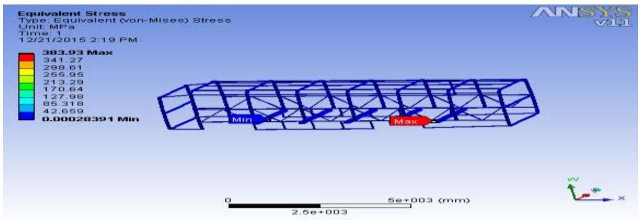

Fig28:Equivalent stress developed is 383.93 Mpa at 18500 N load applied On waist rail

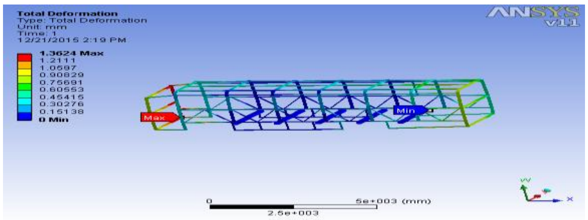

Fig29:Max deformation is 1.3624 mm at 18500N load applied on waist rail

MATERIAL	VON-MISES STRESS (Mpa)		DEFORMATION(mm)	
	10500N	18500N	10500N	18500N
STRUCTURAL STEEL	307.8	383.93	0.85142	1.3624
CARBAN FIBRE	218.91	298.49	0.34051	0.49717
E- GLASS	223.51	298.54	1.9069	2.8279

Table 5.2:Stress and Deformation Comparison of different materials

Note: Fn: Frequency In Hz

Material	Mode1		Mode2		Mode3		Mode4		Mode5		Mode6	
	Fn	T.D	Fn	T.D	Fn	T.D	Fn	T.D	Fn	T.D	Fn	T.D
CarbonFiber	18.234	3.797	21.949	4.0853	34.177	5.1588	43.167	6.218	59.349	7.126	66.46	8.787
E-Glass	6.244	3.010	7.5289	3.2384	11.719	4.1032	14.81	4.955	20.319	5.650	22.77	6.9812
Structural Steel	5.936	1.72	7.1149	1.8431	11.076	2.3326	13.996	2.815	19.214	3.214	21.53	3.9733

T.D: Total Deformation in mm

Table5.3:Frequency and Total Deformation Comparison of Different Material

Note: Fn: Frequency In Hz

T.D: Total Deformation in mm

IV. RESULTS AND DISCUSSIONS

The structural Analysis identity is done for Bus body extremely good shape figures are shown in CHAPTER four, the version is discritized in to 241728 factors and 474933 nodes. The following are the conclusions based on the Analysis results obtained by appearing analysis on special locations(Cant rail, waist rail) of the Bus body brilliant structure .The following conclusions are written for carbon fiber and E-Glass compared to the Structural metallic

The max strain advanced for structural metallic is 307.Eight Mpa and Max deformation is zero.85142 mm at 10500N Load is applied on cant rail and for Carbon Fiber the max pressure 218.Ninty one Mpa and Max deformation is zero.34051mmThe max stress developed for structural steel is 383.Ninety three Mpa and Max deformation is 1.3624mm at 18500N Load is applied on waist rail and for Carbon Fiber the max stress 298.49 Mpa and Max deformation is zero.49717 mm.And grass weight is for structural steel is 1494 Kg and for carbon fiber is 308.78 Kg, deformation and gross weight are much less for CARBON FIBRE as in keeping with this end result.

The max stress developed for structural metallic is 307.8 Mpa and Max deformation is 0.85142 mm at 10500N Load is implemented on cant rail and for E-Glass the max pressure 223.51Mpa and Max deformation is 1.9069 mmThe max strain developed for structural steel is 383.Ninety three Mpa and Max

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deformation is 1.3624mm at 18500N Load is carried out on waist rail and for E-Glass the max strain 298.54Mpa and Max deformation is 2.8279 mm.And grass weight is for structural metal is 1494 Kg and for carbon fiber is 490.2 Kg, deformation is more and gross weight is less for E-Glass as per this result.

The model evaluation is finished for 3 exceptional materials whish are Structural Steel, carbon fiber and E-Glass, the outcomes shows that the figures are enclosed in CHAPTER four.

MATERIAL	VON-MISES STRESS (Mpa)		DEFORMATION(mm)	
	10500N	18500N	10500N	18500N
STRUCTURAL STEEL	307.8	383.93	0.85142	1.3624
CARBAN FIBRE	218.91	298.49	0.34051	0.49717
E- GLASS	223.51	298.54	1.9069	2.8279

Table 6.1:Stress and Deformation Comparison of different materials

V. CONCLUSION

The bus body Super structure is analyzed by using using Ansys for unique materials like Carbon Fiber-Glass and Structural Steel ,as in line with the result the most deformation occurred for Structural metal and E-Glass are more compared to carbon fiber and E-Glass, so this project to recommends the carbon fiber for Construction of Bus body Super Structure.

The lessen weight of the bus structure is much less for Carbon Fiber is less while as compared to Structural Steel and E-Glass materials we can lessen the burden 78.2% whilst the structural metallic is changing by way of carbon fiber ,so this challenge work can prefer the carbon fiber for bus shape production and also improve the mileage of vehicle.

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