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Analysis and Fabrication of Rollcage for Solar Vehicle

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Abstract: **This work, focused on an idea about hybrid solar car technology which solves the major problem of fuel and pollution in present days. Determine how feasible widespread change to hybrids would be in future with all information taken into account, concluded that hybrids have several advantages as fuel efficient, low pollution. In the present work a complete drawing and drafting of hybrid solar car have been prepared using CATIA V5R19 software. After complete analysis of this drawing by using ANSYS 14.5 it is find out bear capability of load, stress, and strain of front & rear collision of car frame. A completed data are analyzed to examine the technical aspects of the hybrid car technology. Overall, hybrid technology has a lot of potential in the distant future, but as for right now they are not a significant applied over today's internal combustion engine.**

Keywords: **Solar vehicle, solar energy, CATIA V5R19, ANSYS 14.5, renewable energy etc.**

1. INTRODUCTION

THe Solar power is an increasing market for more developed countries, which can benefit from less electric expense over time. It is also good for the environment because it replaces the traditional, and in effect harmful, methods of energy production. There are other renewable energy sources besides solar, but it is especially practical for sunny areas which have less wind and water resources. Applications for this energy source can be from single houses and large electrical grids to cars, exhibiting a versatility perfect for the needs of a developing country.

A solar car is a solar vehicle used for land transport. Solar cars combine technology typically used in the aerospace, bicycle, alternative energy and automotive industries. The design of a solar vehicle is severely limited by the amount of energy input into the car. Most solar cars have been built for the purpose of solar car races. Since 2011 also solar powered cars for daily use on public roads are designed. Solar cars depend on PV cells to convert sunlight into electricity. PV cells directly convert sunlight into electricity. When sunlight (photons) strikes PV cells, they excite electrons and allow them to flow, creating an electrical current. PV cells are made of semiconductor materials such as silicon and alloys of indium, gallium and nitrogen. Silicon is the most common material used and has an efficiency rate of 15- 20%.

The brief study of hybrid solar car is efficient in our daily life because now day's pollution and fuel rate is very big problem many people having fuel cars. Use of solar energy is being used for car, besides the control of vehicular pollution in the city, less consumption of fuel, Hybrid solar car are effective reducing global warming and environment problem in big frame. In the present work, the objective of this work is to estimate the potential of both energy as PV energy and mechanical engine power, both powers will be utilized in running car with weight reduction can be achieved primarily by the introduction of better material, design optimization and better manufacturing processes. The hybrid solar car is one of the potential items for weight reduction in hybrid solar car as it accounts for 5% - 10% of the weight. Various advantages for hybrid solar car by using solar technology

1. Reduction in conventional car demand in urban city
2. Minimum the pollution problem in urban city
3. Give clean energy which will reduce the carbon dioxide emission every month

2. LITERATURE REVIEW

In this paper present with a detailed study of optimal sizing, fuel consumption of a solar car based on a longitudinal vehicle dynamics mode and energy flow, weight, overall cost of vehicle. It is shown that fuel saving can be achieved for intermittent use with average power and economic feasibility. Hybrid Solar Vehicles (HSV), derived by integration of Hybrid Electric Vehicles with Photo-Voltaic sources, may represent a valuable solution to face both energy saving and environmental issues, particularly in urban driving. This paper is also focuses on the general, technological issues and challenges ahead of plug-in hybrid electric vehicles in relation to major components which can be used for detail of design consideration and selection of component for electric motor and battery bank, control strategy. Other technical challenge as light weight material used in a vehicle, low resistance tire and better aerodynamic structure of its .it type of vehicle is importance of economies and successful deployment of this plug- in hybrid technology we investigate the use of photovoltaic systems as auxiliary power generators in hybrid and electric vehicles. This technology provides an as yet unexploited possibility with the advantages of a new power source, which is light, noiseless, maintenance-free and continuously working.

3. MODEL AND DESIGN

It is designed by using in CATIA V5R19 software. Firstly, we design a framework and then we are design different parts of solar car like as solar panel, IC engine, transmission system, braking system, wheels and axles, steering system and dashboard. All these system is design after it will be assembled in frame of car.

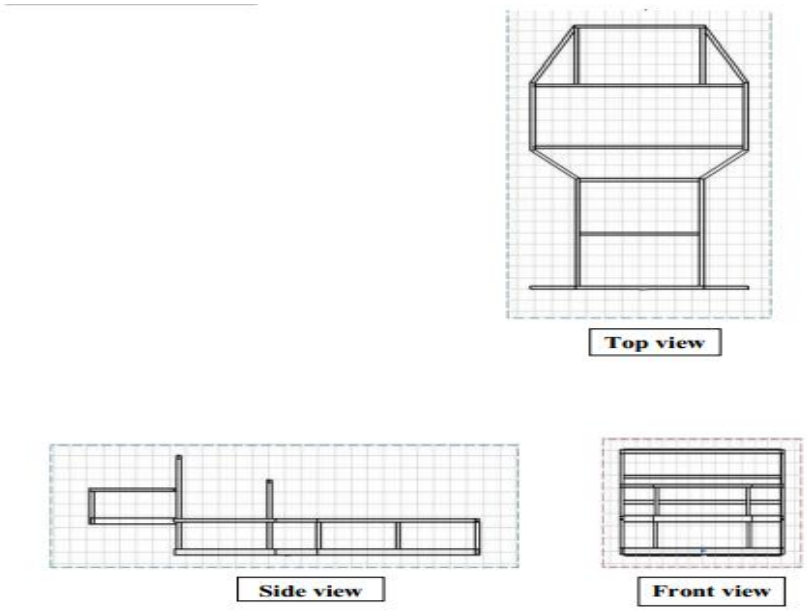

Figure.1: Different view of solar car with the help of CATIA V5R19 software.

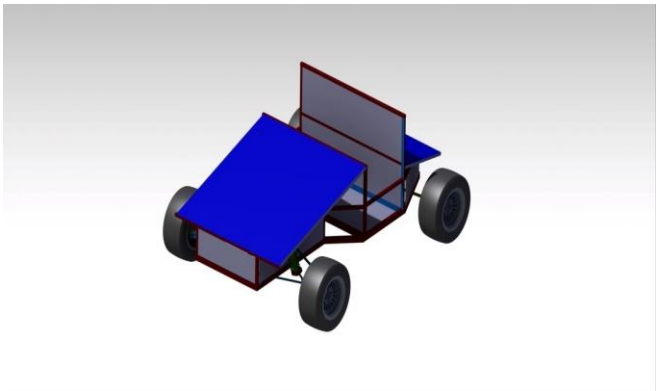

Figure.2: 3D view of vehicle

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DESIGN CONSIDERATIONS:

- Weight of the chassis should be as low as possible.
- The design should allow for a driver egress of 5 seconds.
- The driver should have a vision of 200 degrees with 100 degrees on either side.
- Driver comfort**.**
- The design of the chassis was modeled using pro-e, Catia and Ansys software.

DESIGN PARAMETERS:

PARAMETERS	**DIMENSIONS**
Length	inches
Weight	kgs
Height of C.G from the base of the chassis	inches
Width	Inches

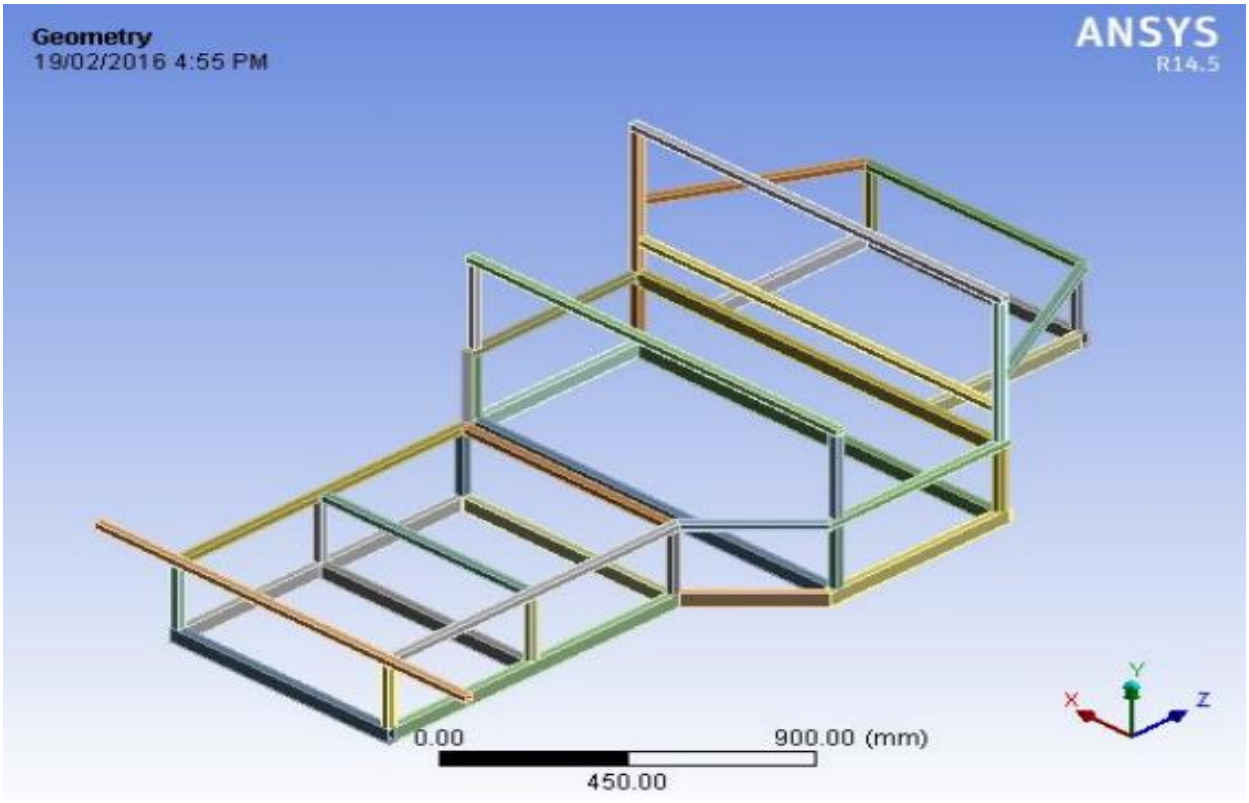

Figure.3: Roll Cage View

ANALYSIS:

The analysis of the chassis was done using **Ansys14.5** software.

4. FRONT IMPACT

Type Of Loading	Front Impact Test
Load	7500N
Equi. Stress	433.26 MPa
Max. Displacement	2.8627 mm
F.O.S	1.4633

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STATIC LOADING:

It is the load acting on the chassis due to its own weight when the vehicle is in static condition.

Mass of driver=60 kg

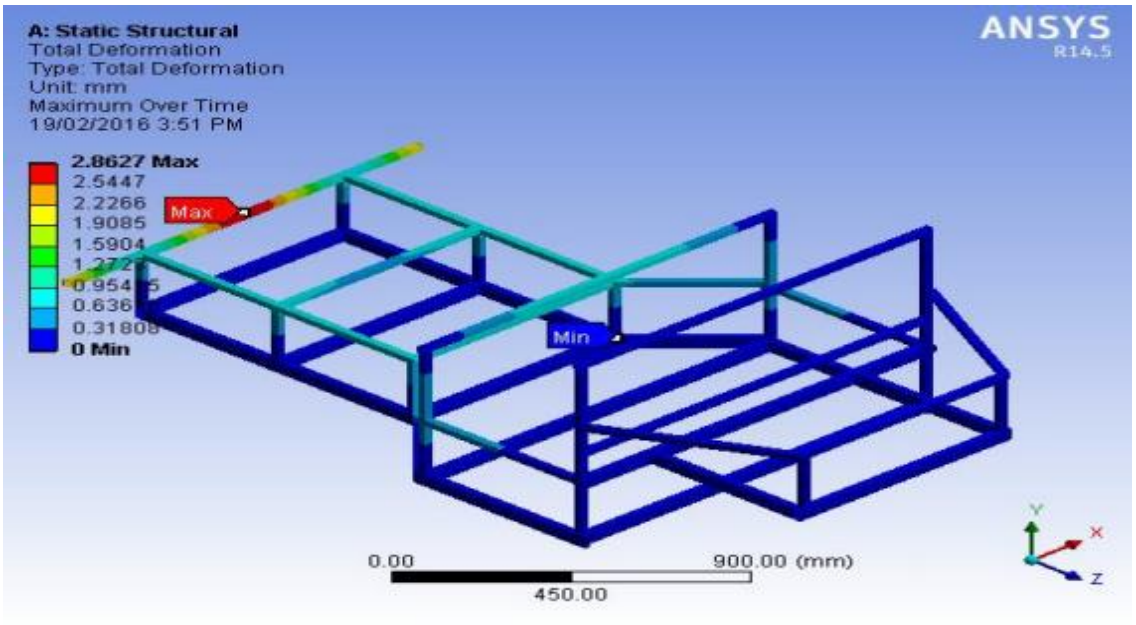
Mass of total vehicle=190 kg

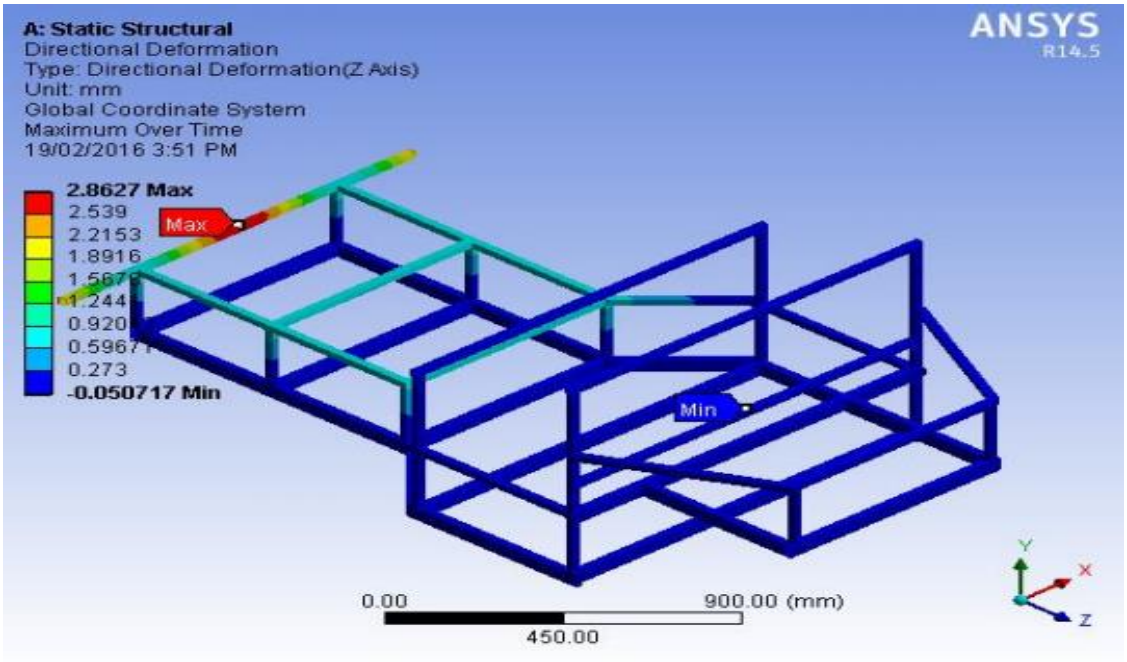
Now, Total mass = 250 kg Vertical force including gravity = 250x9.81=2452.5 N~2500N

(Here G = 2500 N).

Total load = 3*G = 7500 N

NOTE:(*Following calculations and analysis are considered as maximum or extreme conditions of load andpressure, After fabrication (Welding) ,strength of chassis will becomes 2 to 3 times more than present values,Therefore, our actual factor of safety (F.O.S.) goes to 4 to 5 which is obtained 1 to 2 in present calculation.)





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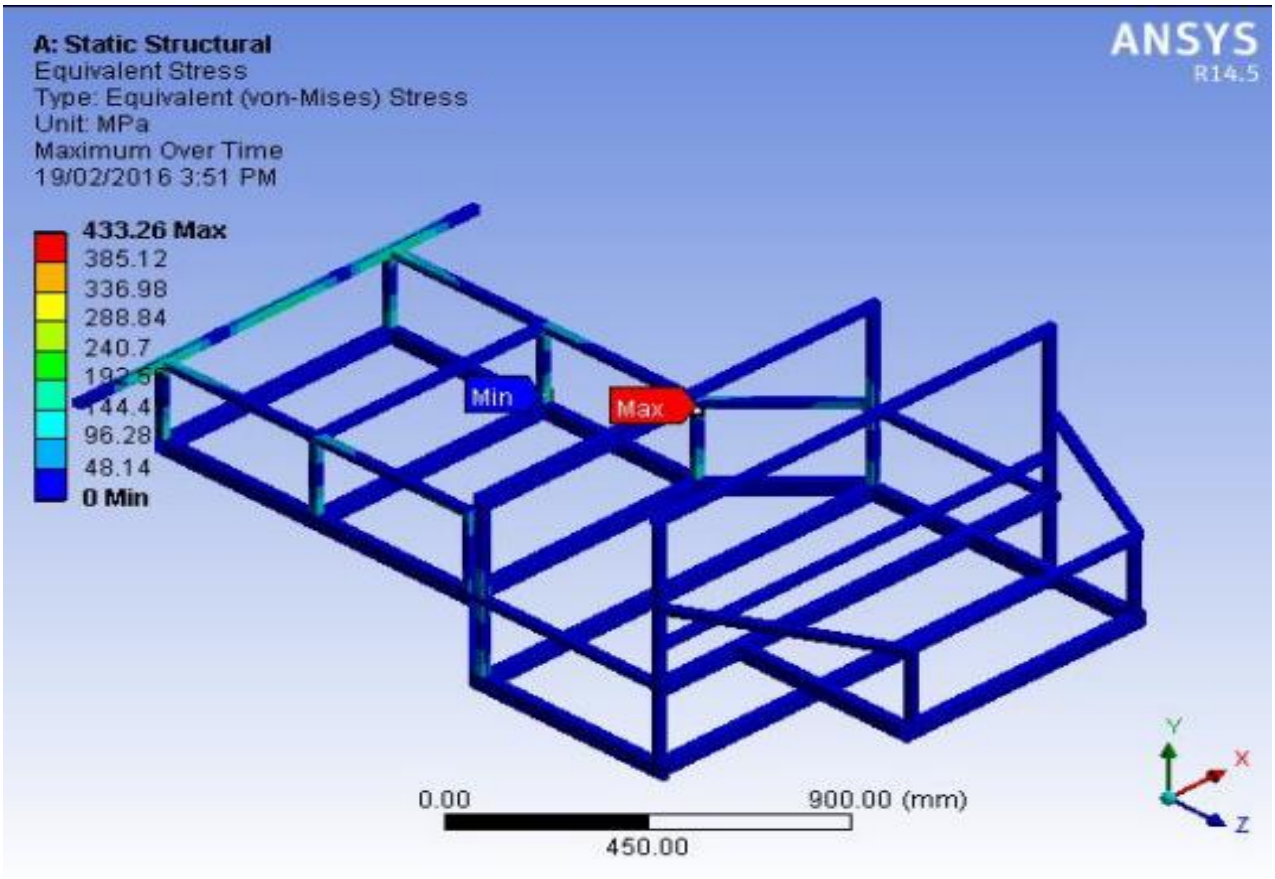
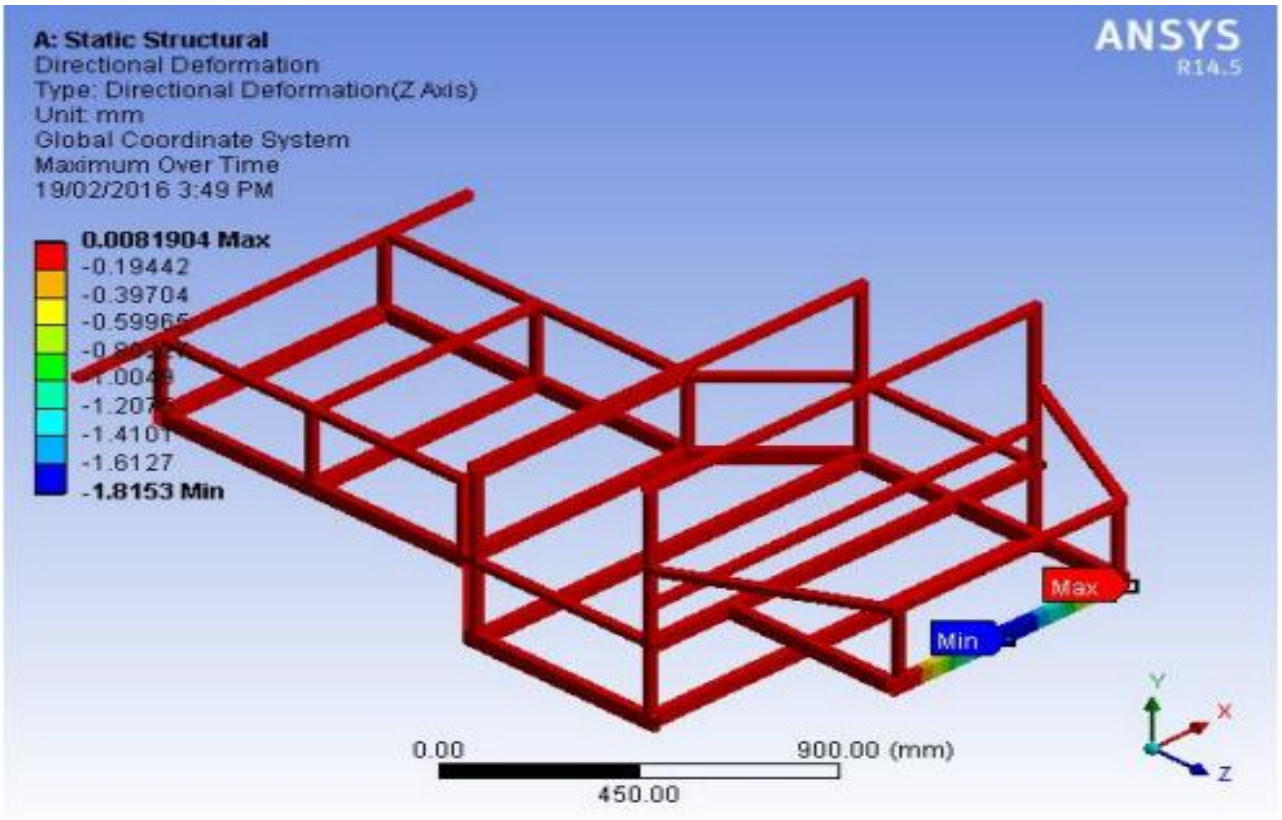


5. REAR IMPACT

Here we assume the force to be the same as that of Front Impact.



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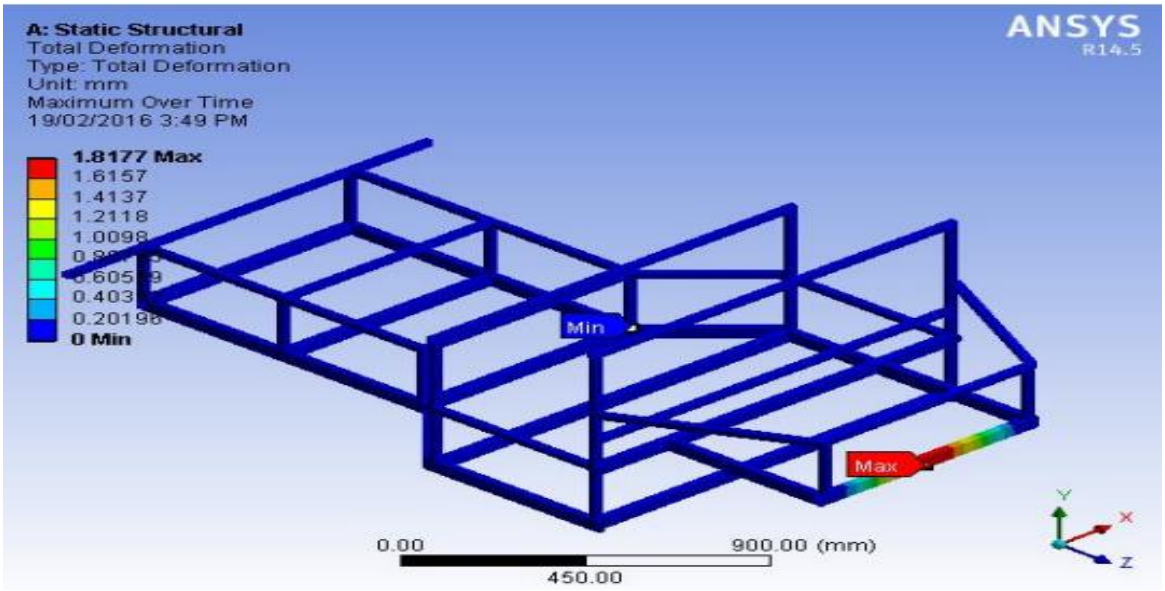

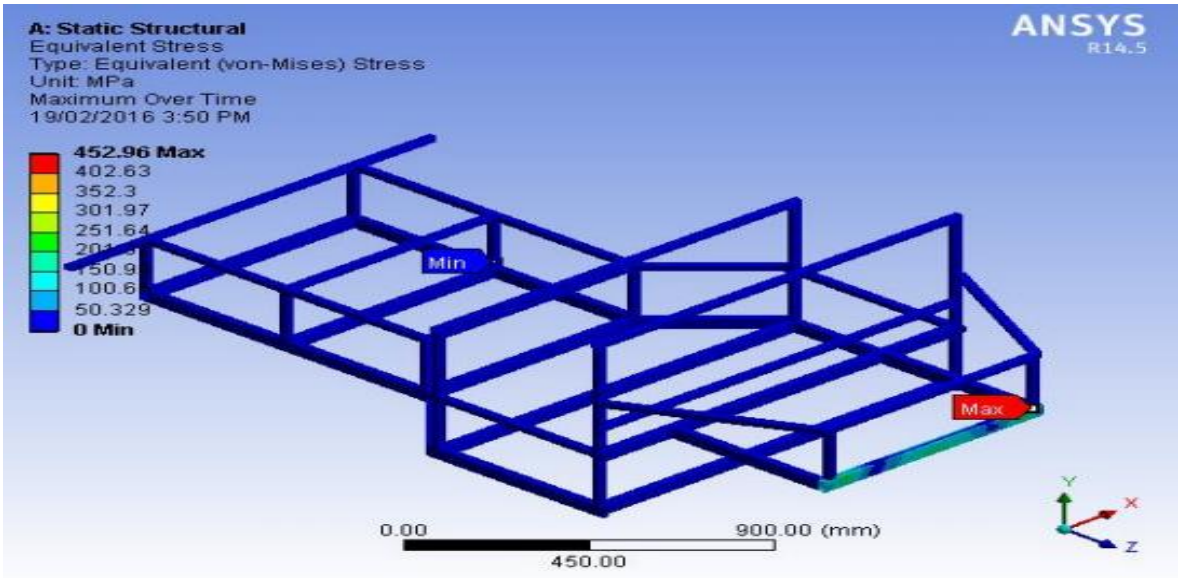

Type Of Loading	Rear Impact Test
Load	3G
Equi. Stress	452.96 MPA
Max. Displacement	-1.8177 mm (-ve comes due to deformation in –ve collision axis.)
F.O.S	1.3996

6. SIDE IMPACT

The force taken in side impact test is same as front impact test and is equal to **3G** as it is the maximum force by which an another vehicle will hit this vehicle.

TYPE OF LOADING	SIDE IMPACT TEST
LOAD	3G
EQUI. STRESS	548.83 MPA
MAX. DISPLACEMENT	3.2989 mm
F.O.S	1.1551

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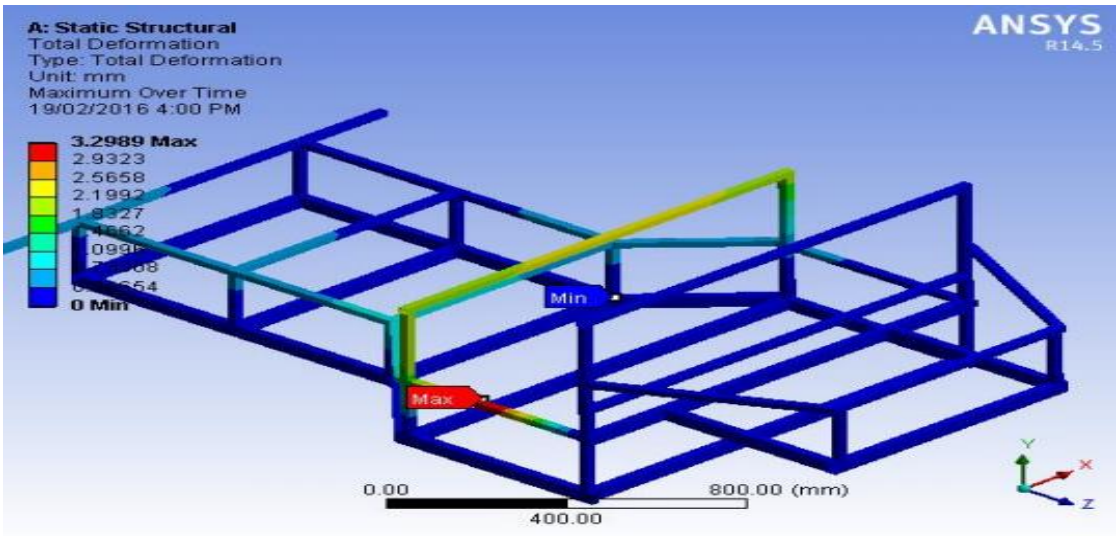

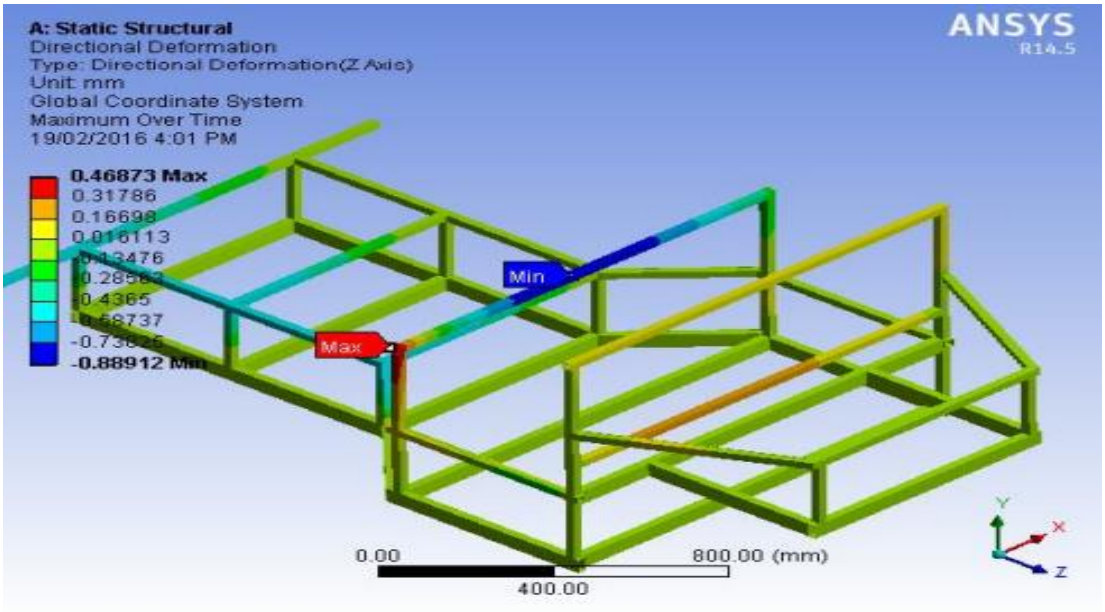

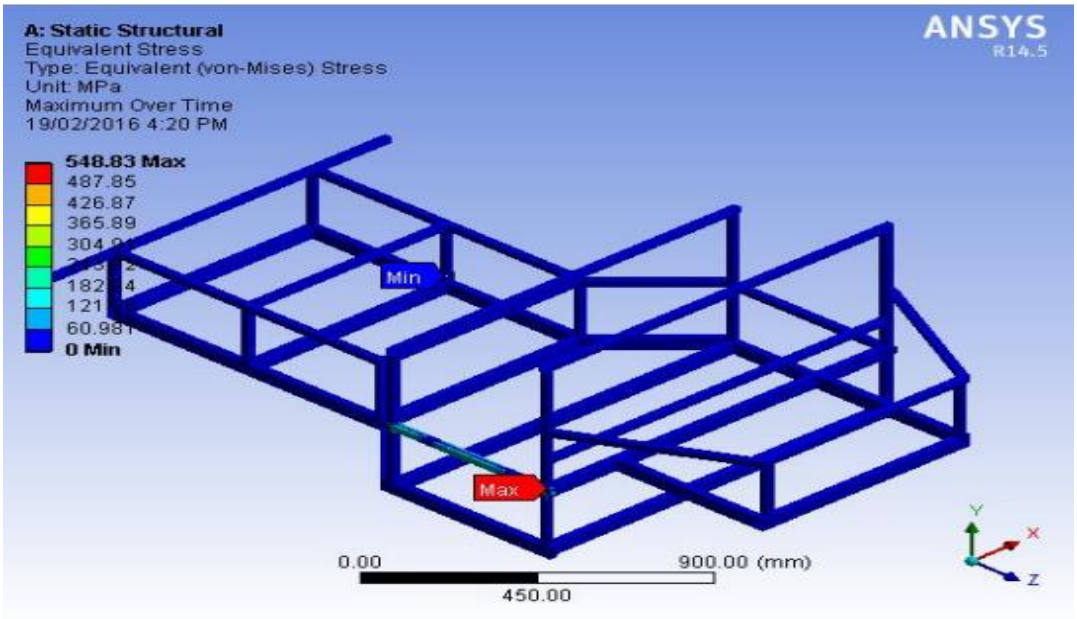

7. CONCLUSION

Suitable design based analysis of hybrid solar car has been given and results of battery bank and sizing, total area of car which can be used in PV array, capacity of total load and analysis of car body have been tabulated.

It will be used for research work and education purpose. In future this type of car have lot of marketing value because it will be used nonrenewable resource and renewable energy .This type of car does not create any pollution so it is also have a lot of positive point toward nature . Only the manufacturing cost is high but maintenance cost is almost zero. Hence this car is economic and environmental friendly

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