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# Analysis of All-Terrain Vehicle

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**Abstract:** This designed ATV uses a universal knuckle as a significant half of their steering systems, it controls the efforts applied further than that of the turning capacities. We are prone to the area unit proposing modification within the materials used which can enlarge the strength of the knuckle. The contemporary technologies developed tools/techniques/methods in reducing the stress and strains while not poignant the physical properties. At intervals the gift work we've got used SOLIDWORKS computer code for scrutiny of knuckle joints with varied materials and ranging hundreds. Steering knuckle plays a consequential character during a vehicle linking the steering mechanism, wheel hub, and brakes for the vehicle body.

## I. INTRODUCTION

### A. Chassis Frame Ansys

The steering system may be a predominant half of the dynamic style of an automobile to facilitate a sleek modification of directions and originate maneuver of the tires ability to induce lateral forces to absolutely optimum extent. The knuckle may be an important element in an associate degree of an ATV as a result it steers and preserve the vehicle stability at over the topspeed. The knuckle beside tie rods converts the force applied at the wheel into rotational motion, serving to the vehicle to indicate. Failure of this element could cause fatal casualties. Thus, it is vital that the knuckle should be designed to such a degree that it should not underperform underneath extreme conditions, have high FPS, high strength, and toughness and be lightweight. In our Project, the knuckle we are inclined to engineer is to amplify the economical use of house, weight and so the safety of the driving force.

### B. Material Used

The material implemented in the planning and development of this project is AISI 4130. This steel renders the necessary strength. This metal combines each iron and carbon component alongside Manganese, sulphur, and additional chemical components. The fabric accustomed to creating the chassis is AISI 4130 steel. This material has pragmatic weld-ability, ductility, and hardness. That being the case creating this chassis we incline to use arc attachment. Chassis is intrinsic in an ATV that holds the integral load and renders suspension, thus it's compelled to possess sensible hardness and won't be compromised with flexibility. The look of the chassis is finished by Solid-works computer code as shown in fig. the load of the chassis is 100kg.

After the design of an ATV was concluded the frame was analyzed on ANSYS for various impact tests which are discussed below:-

<sup>1</sup>Front Impact, <sup>2</sup>Rear Impact, <sup>3</sup>Side Impact, <sup>4</sup>Roll Over.

The "G Force" method was employed as it is the most commonly used method for analyzing when prototype testing could not be done due to some limitations such as lack of resources.

As per calculation:

$$G = m * g = 250 * 9.81 = 2452.5N$$

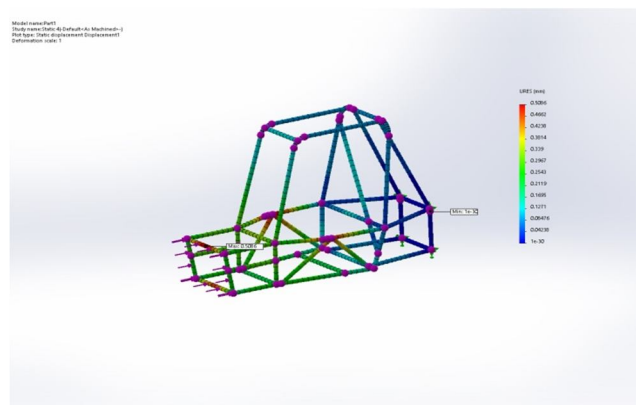
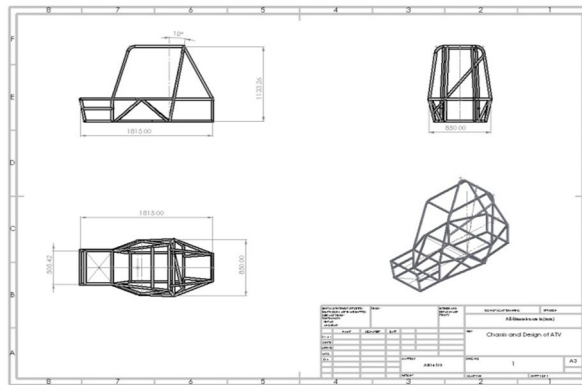
Where,

m=mass of ATV

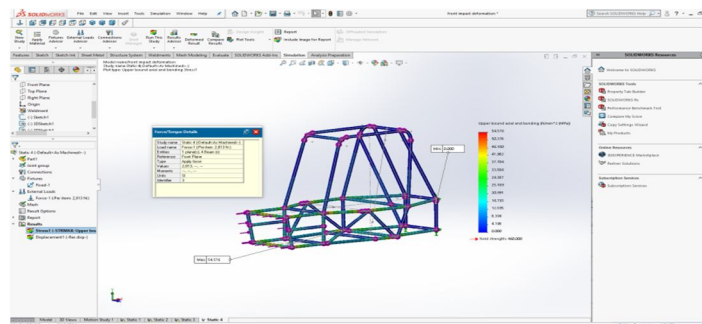
g=acceleration due to gravity.

### G- Force Applied

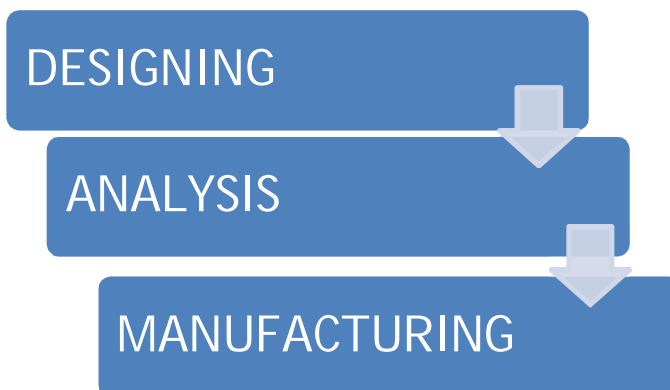
Front Impact	5G
Rear Impact	3G
Side Impact	2.5G
Roll Over	1.5G

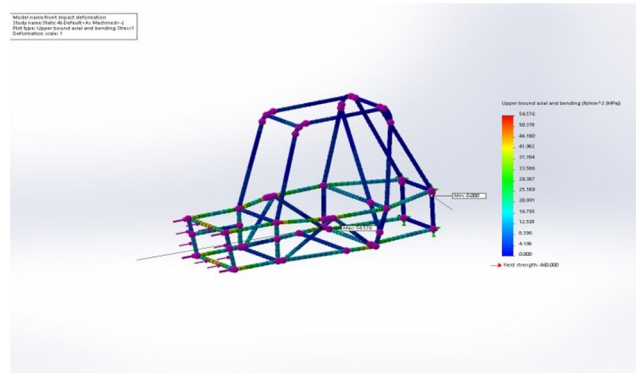


DISPLACEMENT



STATIC





STRESS

### C. Knuckle Designing And Analysis

The objective of the study is to design a steering Knuckle possessing minimum weight as well as maximum strength. Furthermore, the knuckle is an important part of an ATV as it assists steering and restoring the vehicle stability at high speed. The knuckle at the side of the tie rod converts the force applied to the wheel into rotational motion. The material of the knuckle is Stainless Steel/ Aluminium Alloy.



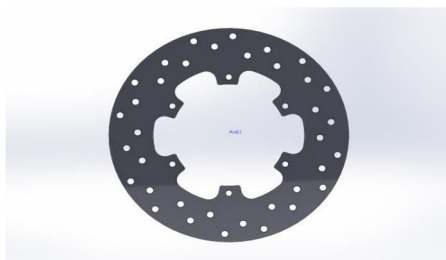
FRONT KNUCKLE



REAR KNUCKLE

#### D. Brake

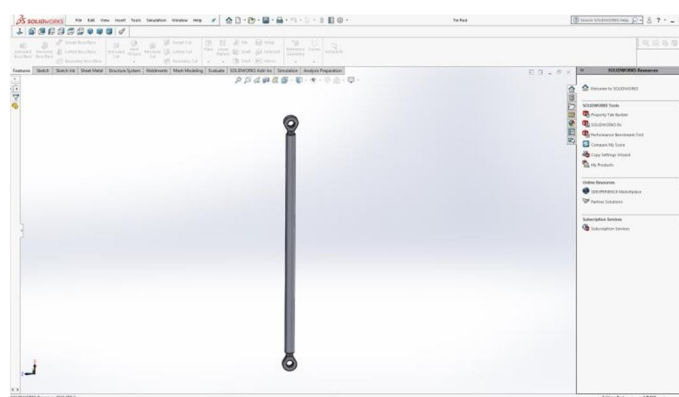
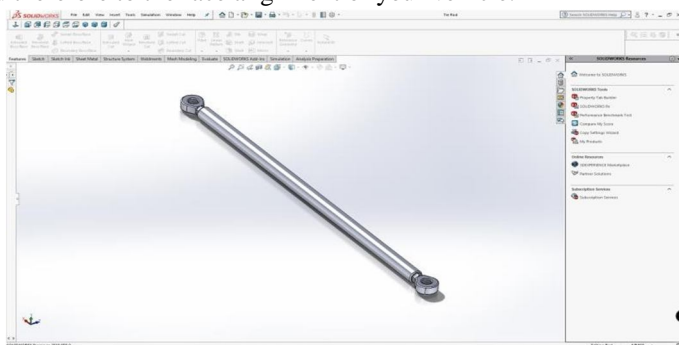
A disc brake is a kind of brake that employs the calipers to squeeze pairs of pads against a disc. This action slows the rotation of a shaft, namely a vehicle axle, either to reduce its movement speed or to prosper it stationary. The energy of motion is born-again into waste heat which is compelled to spread or cooled by Air. The material of Disc is AISI sort 316 F.



3D CAD DESIGN

#### E. TIE ROD

Tie rods help your vehicle in the appellation of steering. Tie rods have 2 components, an associate inner, and outer finish. The rod works with the Ball joint in substituting force from the steering center link to the steering “knuckle”. Merely place the tie rods to facilitate steering swimmingly and therefore to the face alignment of your vehicle.



#### REFERENCES

- [1] U. Yashvanth, Mohammad Raffi, G. Raghu Vamsi Reddy. (2019). Dynamic impact analysis on ATV upright. International Journal of Mechanical and Production Engineering Research and Development.
- [2] Anshul Dhakar and Rishav Ranjan (2016). Force calculation in the upright of an FSAE race car. International Journal of Mechanical Engineering and Technology.
- [3] Duygu GÄ¼ler. (2006). Dynamic analysis of double-wishbone suspension. A Thesis Submitted to the Graduate School of Engineering and Sciences of zmir Institute of A Thesis Submitted to the Graduate School of Engineering and Sciences of zmir Institute of Technology.
- [4] Sanjay Yadav, Ravi Kumar Mishra (2016). Design and Analysis of Steering Knuckle Component. International Journal of Engineering Research & Technology.
- [5] Gondi Prabhu Charan Teja, K.V.P.P. Chandu (2016). Weight optimization of steering knuckle joint using FEA. International Research Journal of Engineering and Technology.





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