DESIGN REPORT -II

PRESENTED BY

Team Name: CRANKY
Team ID: BDC2023034

Kongu Engineering College

Perundurai, Erode.

638060

BICYCLE DESIGN COMPETITON-2023

SIGNATURES

KOUSHIK KANNA G
TEAM CAPTAIN

Dr. P. C. MURUGAN
FACULTY ADVISOR

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1. Finite Element Analysis:

The act of modelling a part's or assembly's behaviour under defined conditions in order to analyse it using the finite element method is known as **Finite Element Analysis (FEA)**. Engineers use FEA to help simulate physical processes, which reduces the need for physical prototypes and allows for component optimization throughout the project design phase.

2. Analysis of the parts:

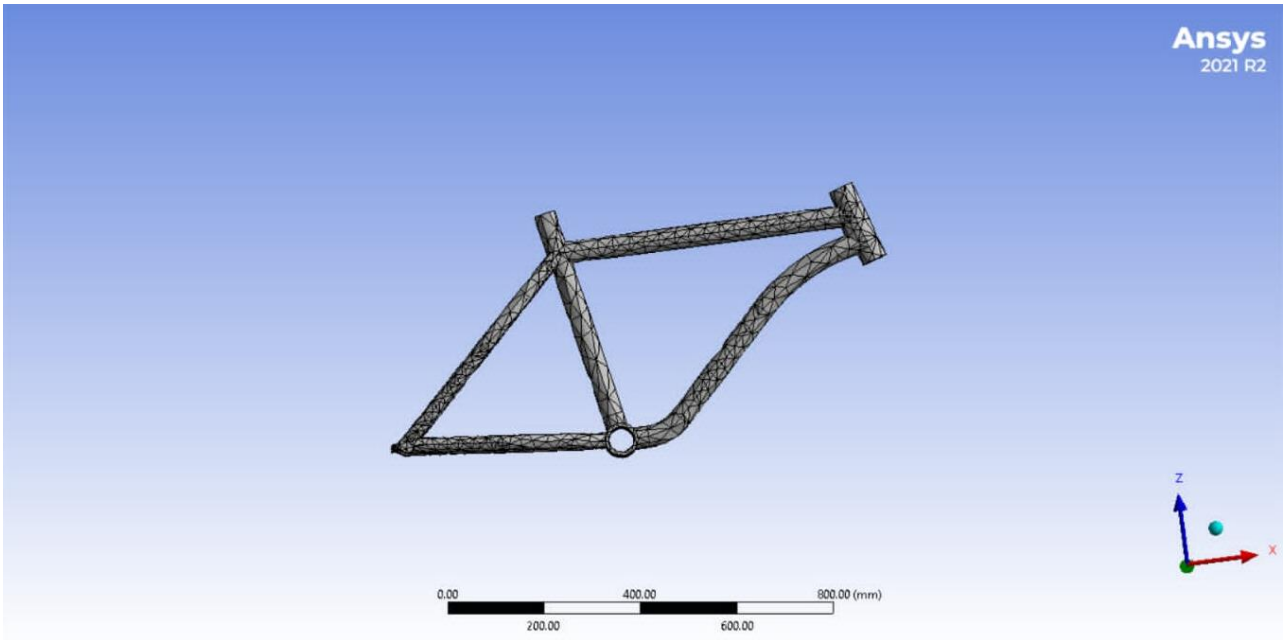
The main frame, fork, pedal, saddle post, and handle bar of a bicycle were all examined under various situations. And, based on these, a few changes to the frame's design were made. The revised designs were examined once again to confirm that the outcomes were as predicted.

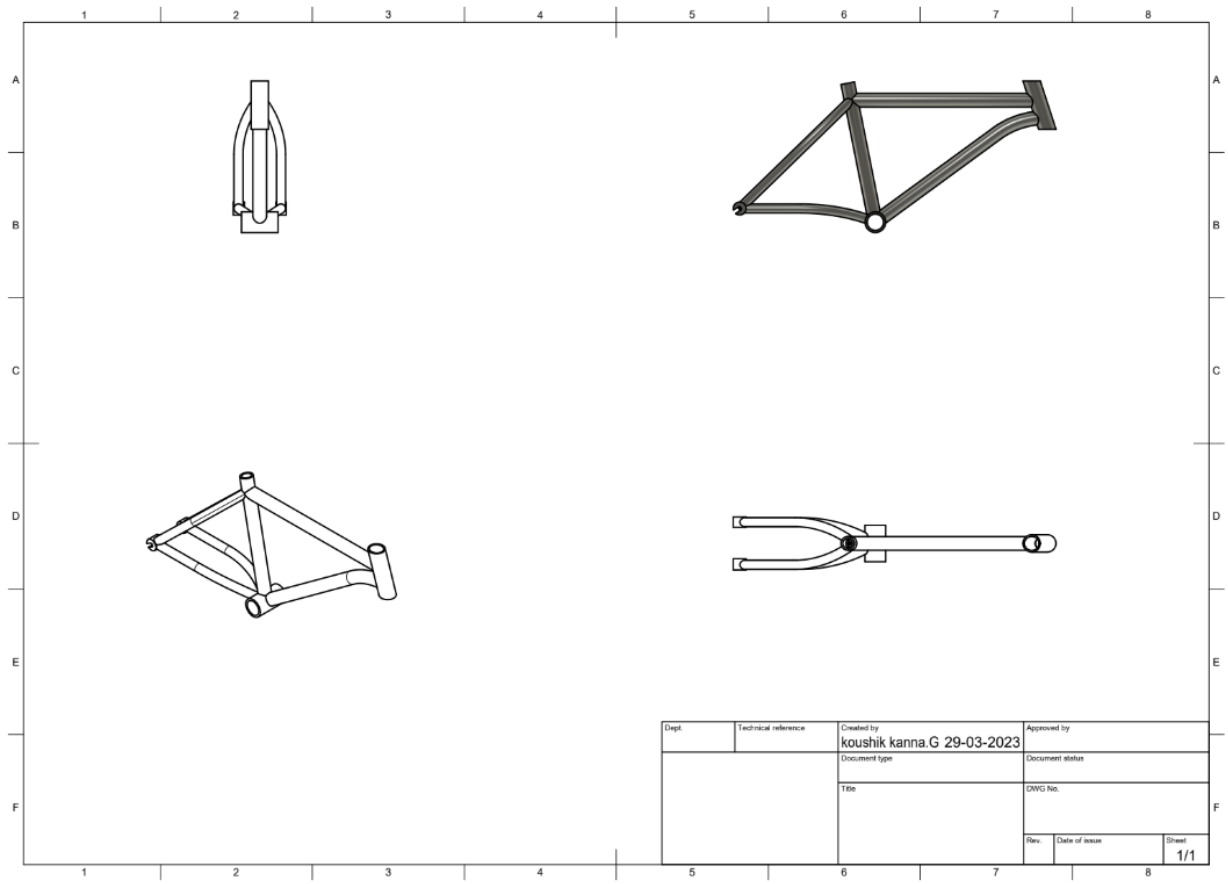
Solidworks, a FEA software that we propose to use for our investigation, was used to construct and evaluate the designs.

3. Analysis of the frame:

We modified the frame design to obtain steady loading and response conditions as assumed. We applied 70kg load and determined displacements, factor of safety, stresses and strains. By default, Alloy steel is the material used for our frame.

3.1 Cycle frame:

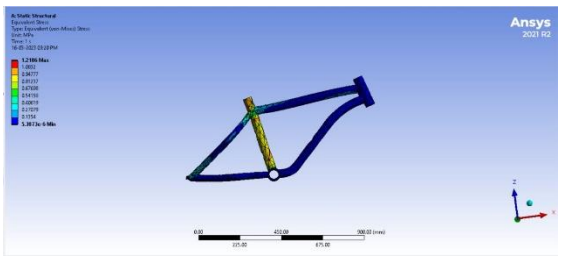




Model name: Frame

3.2 Material properties:

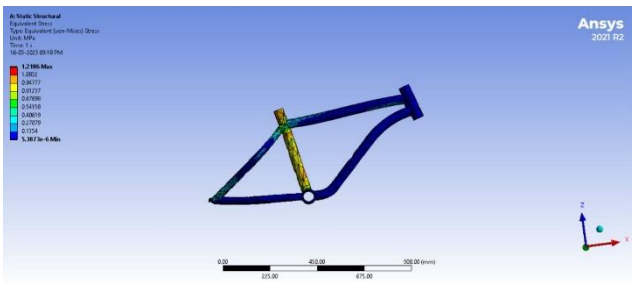
Model Reference Properties



Name: **6061-T6 (SS)**
Model type: **Linear Elastic Isotropic**

Yield strength: **2.75e+08 N/m^2**
Tensile strength: **3.1e+08 N/m^2**
Elastic modulus: **6.9e+10 N/m^2**
Poisson's ratio: **0.33**
Mass density: **2700 kg/m^3**
Shear modulus: **2.6e+10 N/m^2**
Thermal expansion coefficient: **2.4e-05 /Kelvin**
maximum stress: **1.2186**
minimum stress: **5.3873e-6**

3.3 Fixture property:



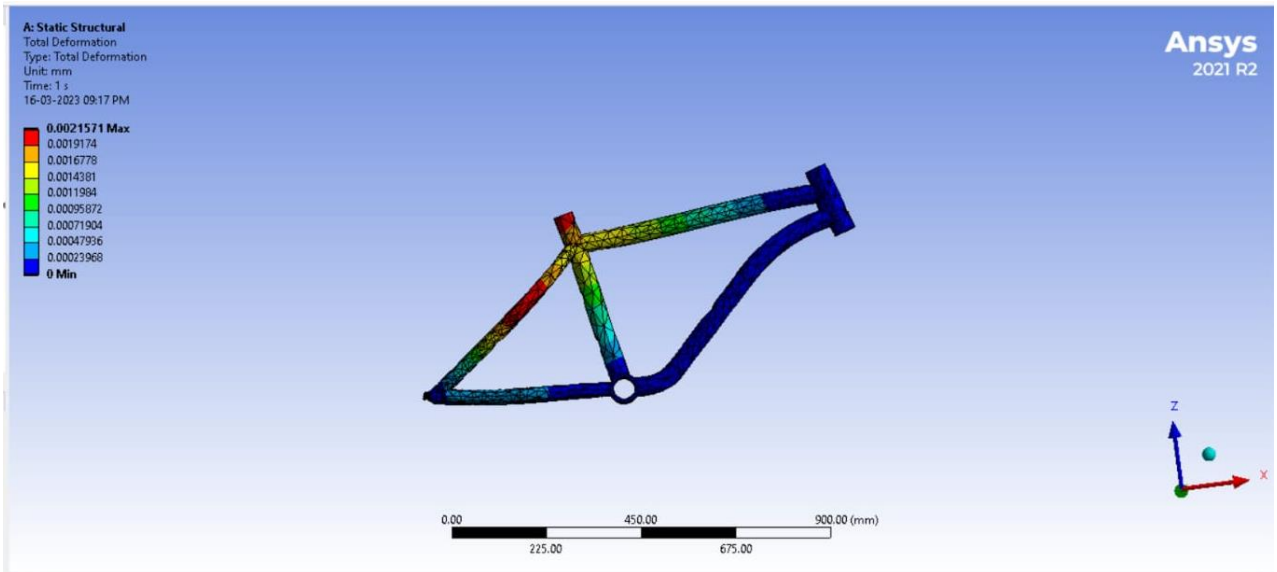
Fixture name Fixture Image Fixture Details

Entities: 4 face(s)
Type: Fixed Geometry

3.3 Mesh details:

The model is then meshed, which breaks down the geometry into simple elements that can be used as discrete local approximations to the larger domain. To strike a balance between saving time and obtaining accurate results, an intermediate mesh between coarse and fine is chosen.

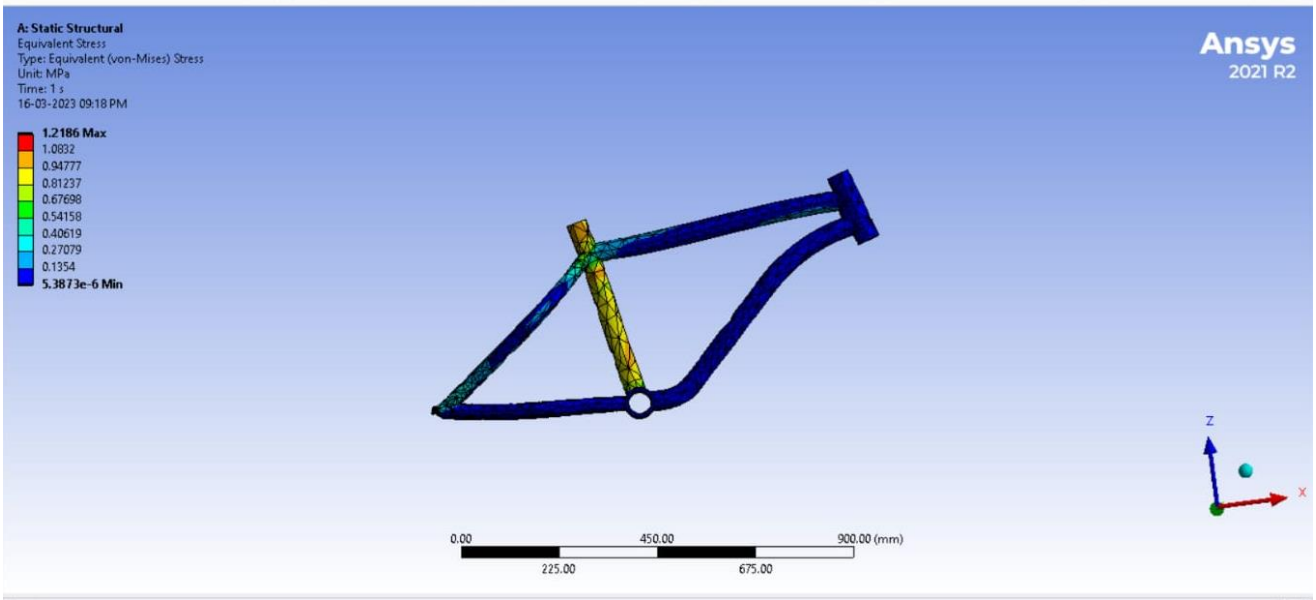
Total Nodes	147733
Total Elements	87343
Maximum Aspect Ratio	3809.8
% Of elements with Aspect Ratio < 3	93.4
% Of elements with Aspect Ratio > 10	0.0538
% Of distorted elements	0.00229



3.5 Study results:

Name Type Min Max
Displacement URES: Resultant Displacement 3.724e-02 mm Node: 223
1.000e+01 mm Node: 1

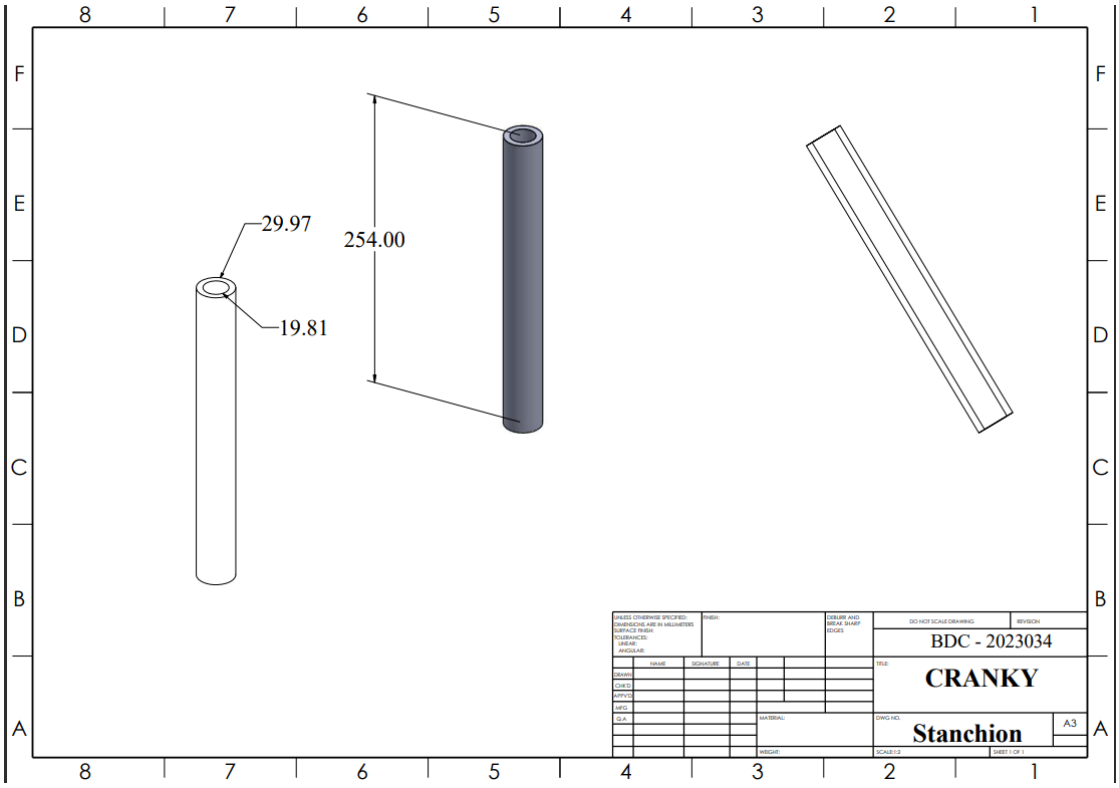
Displacement test



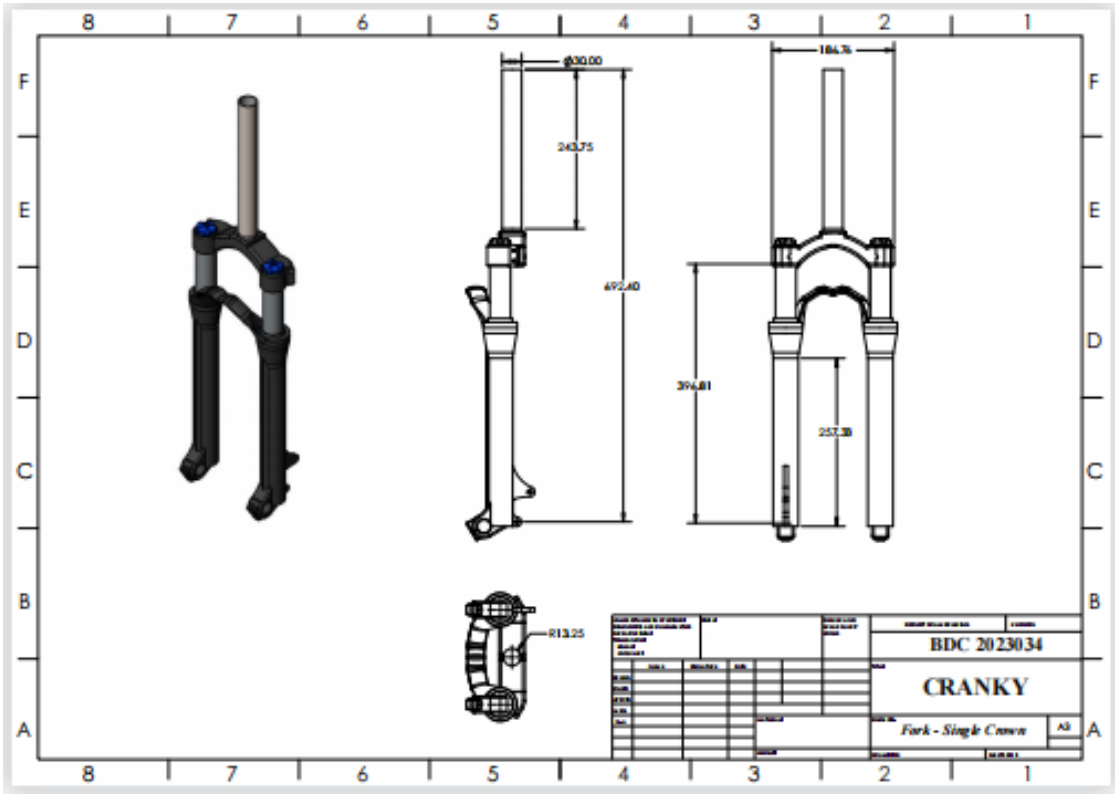
4. Parts diagram for suspension

1. Stanchions.
2. Sliders

Stanchions diagram



Sliders diagram



5. Analysis of the handlebar:

The steering control of a bicycle is called a handlebar. It's a vehicle or vessel's counterpart of a tiller, as it's usually physically attached to a pivoting front wheel through a stem, which connects it to the fork. Aside from steering, handlebars carry a portion of the rider's weight and serve as a suitable mounting location for brake levers, depending on the rider's riding posture. As a result, a handlebar inspection is required. At the midpoint of the handlebar, a 20-kilogram load is applied.