DESIGN PRESENTATION

TEAM NAME	**: SYGNITORS**
TEAM VIN NO	**: 2427**
COLLEGE NAME	**: SNS COLLEGE OF TECHNOLOGY**
KARTCATEGORY	**: 150 cc**

COLLEGE LOGO

KART 3D MODEL

TEAM LOGO

TEAM STRUCTURE

Faculty Advisor : Mr. Anand M

Captain : Sabarishwar S

Vice-Captain : Muthukumaran M

Pilot : Dawn Hiruthayasawmy S

Co-Pilot : Guru Prasath S R

Design Head : Akash K

Braking Head : Dawn Hiruthayasawmy S

Aesthetic Head : Ronald Colman M

Engine & Transmission Head : Rithikmass D

Innovation Head : Sharma E

Fabrication Head : Sudharsan S

Steering Head : Muthukumaran M

VEHICLE SPECIFICATION

VEHICLE DIMENSIONS

OVERALL LENGTH	: 73 inch	(1850 mm)
WHEEL BASE	: 37 inch	(920 mm)
FRONT WHEEL TRACK	: 42 inch	(1080 mm)
REAR WHEEL TRACK	: 43 inch	(1120 mm)
GROUND CLEARANCE	: 1.5 inch	(38 mm)
OVERALL HEIGHT	: 37 inch	(950 mm)
KERB WEIGHT	: 110 Kg	

TYRE SIZE

FRONT TYRE	: 10x4.5-5
REAR TYRE	: 11x7.10-5

BRAKE

DISC THICKNESS	: 13 mm
TYPE OF BRAKE SYSTEM	: Hydraulic
DISC DIAMETER	: 210 mm
BRAKE FLUID	: DOT 3

ENGINE SPECIFICATIONS

TYPE OF ENGINE	: IC
DISPLACEMENT	: 149 cc
MAXIMUM POWER	: 17 HP (8500 rpm)
MAXIMUM TORQUE	: 15 Nm (7500 rpm)
STARTER TYPE	: Electric

CHASSIS MATERIAL

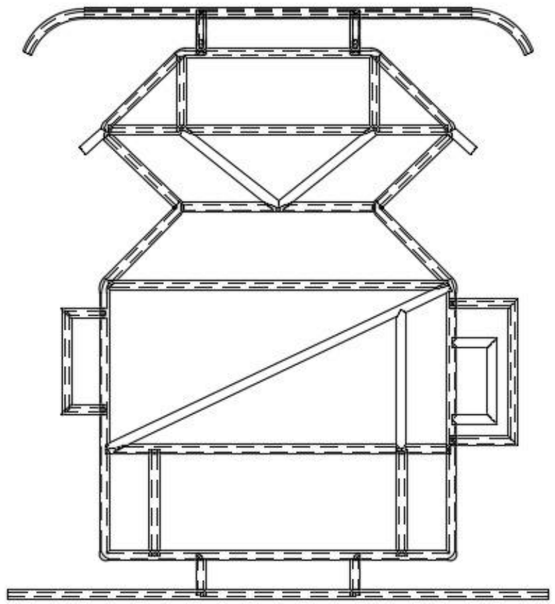
MATERIAL

MATERIAL : ASTM A106 Grade B
LENGTH OF MATERIAL USED : 19.01 meters
OUTER DIAMETER : 2.54 cm (1 inch)
THICKNESS : 0.3 cm (3 mm)
CARBON % : 0.3 %

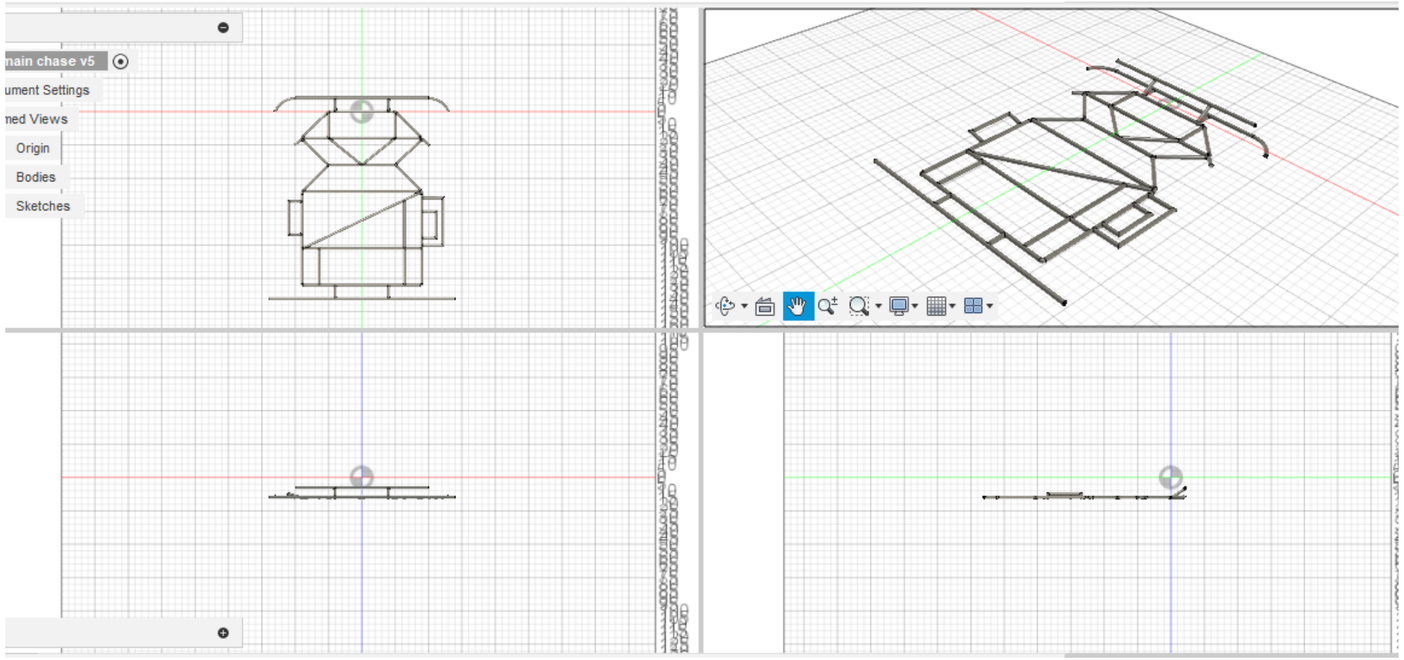
MECHANICAL PROPERTIES

Property	Value
Tensile Strength (Ultimate Strength)	415 MPa (60,000 psi) minimum
Yield Strength	240 MPa (35,000 psi) minimum
Elongation (%)	22% minimum
Hardness (Brinell)	130–179 HB

CHASSIS DESIGN AND ANALYSIS

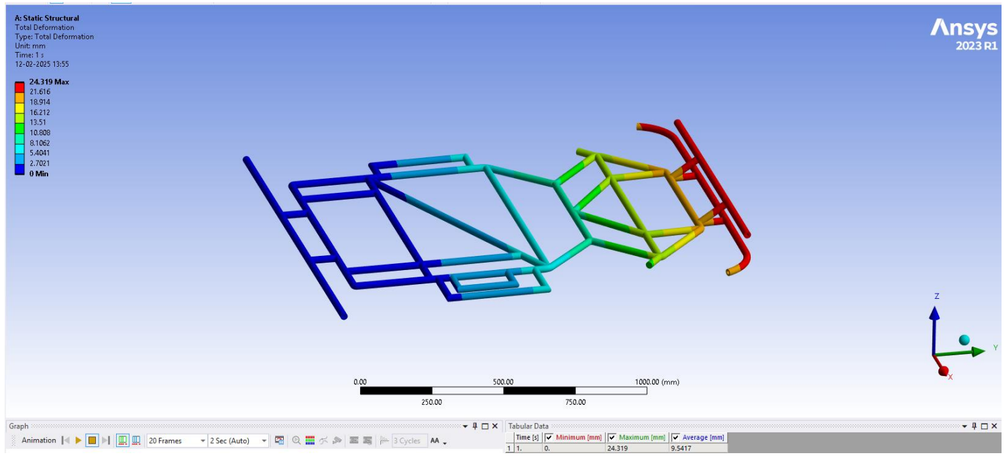


2D DRAWING



3D MODEL OF CHASSIS

CHASSIS DESIGN AND ANALYSIS



FRONT IMPACT TEST

Load Applied: 8000 N

Maximum Stress : 232.9 MPa Induced

Total Deformation : 24.31 mm

Factor of Safety (FOS): 2.03

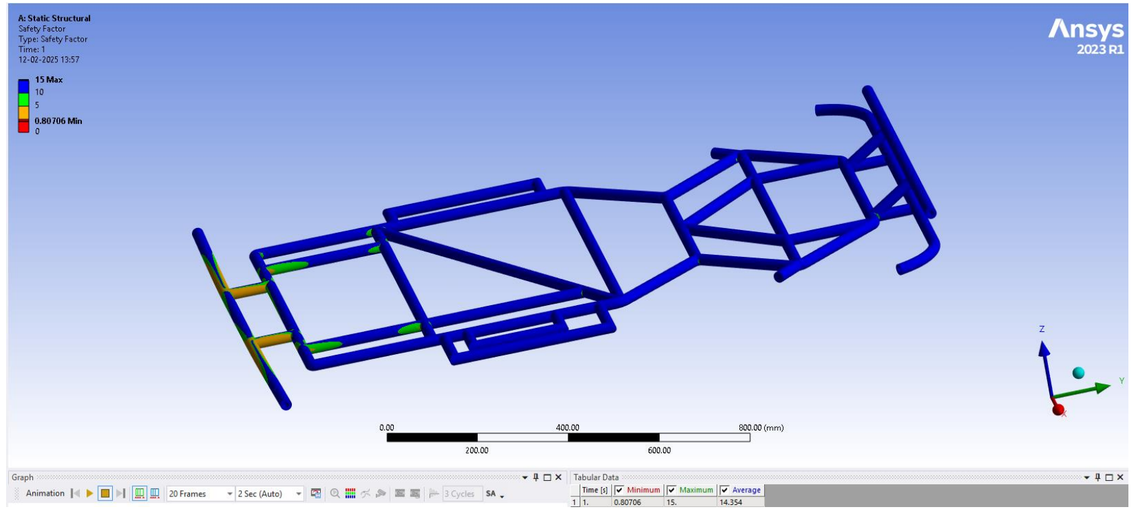
REAR IMPACT TEST

Load Applied: 8000 N

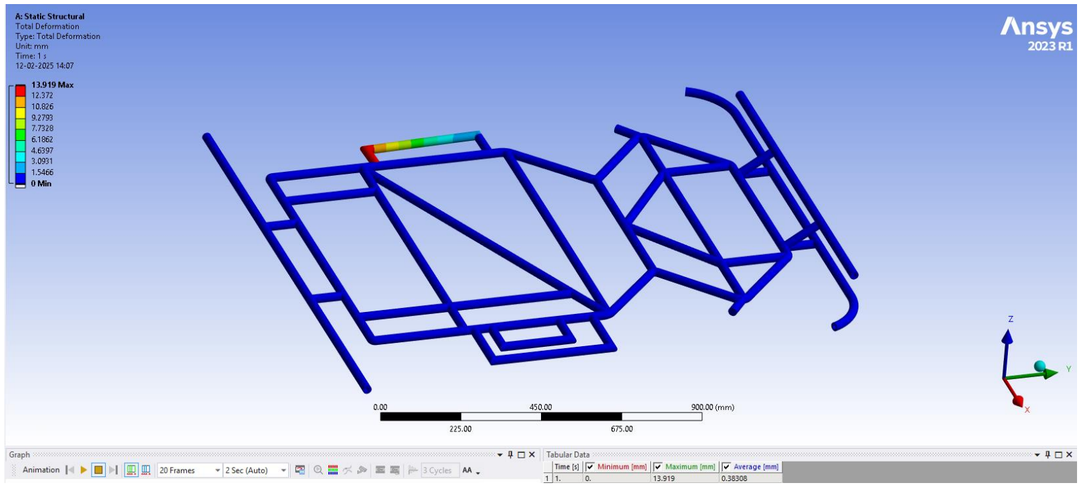
Maximum Stress : 340.74 MPa Induced

Total Deformation : 7.912 mm

Factor of Safety (FOS): 1.85



CHASSIS DESIGN AND ANALYSIS



LEFT SIDE IMPACT TEST

Load Applied : 8000 N

Maximum Stress : 818.06 MPa Induced

Total Deformation : 13.19 mm

Factor of Safety (FOS): 2.01

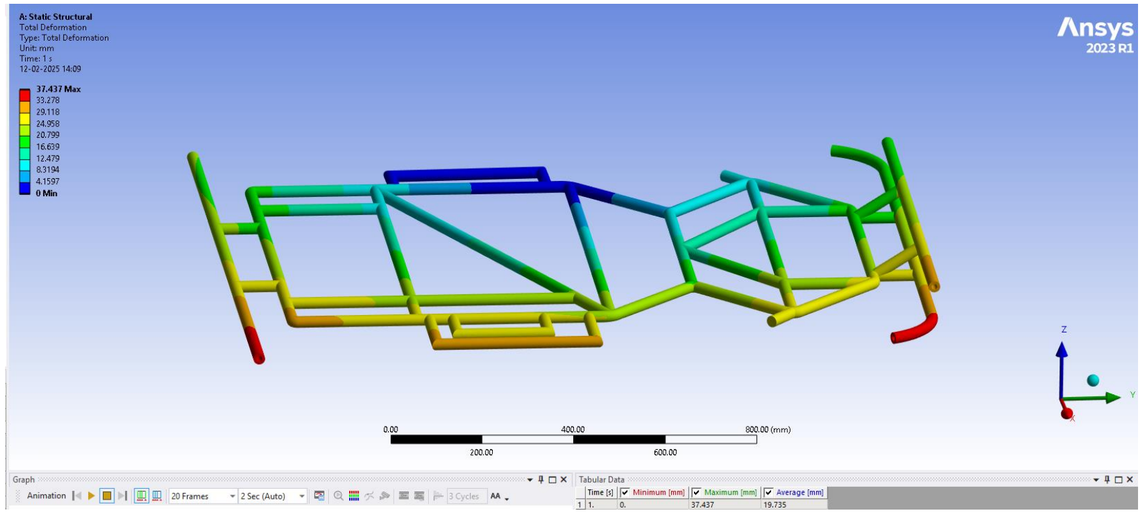
RIGHT SIDE IMPACT TEST

Load Applied : 8000 N

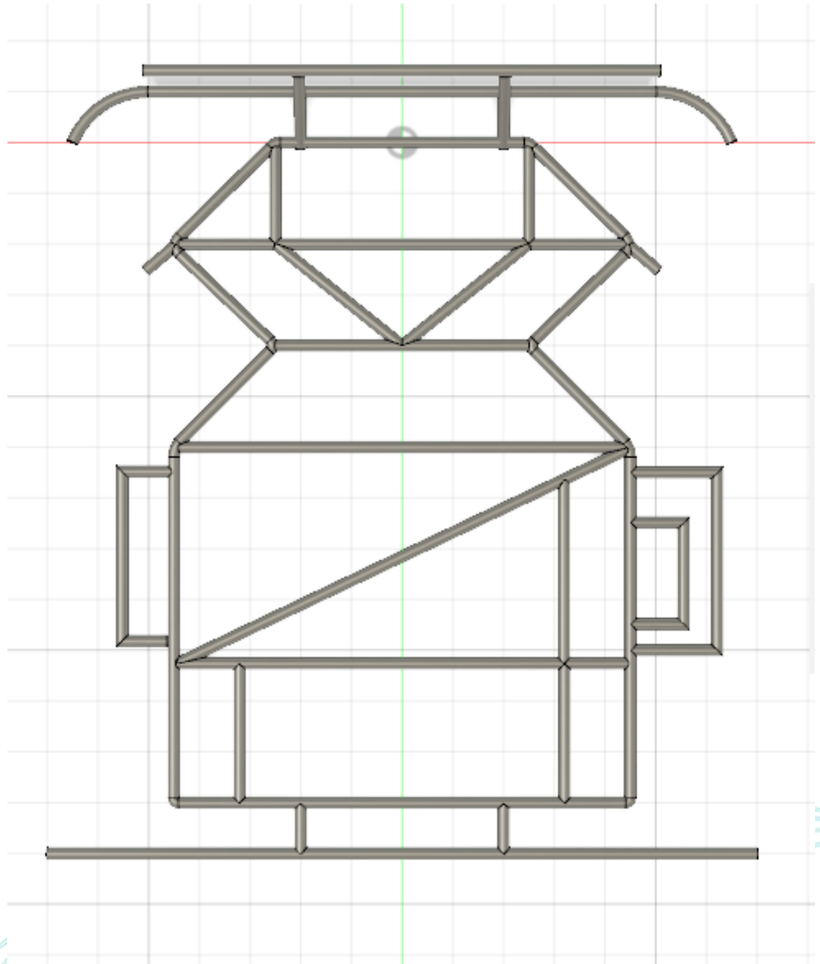
Maximum Stress : 787.81 MPa Induced

Total Deformation : 37.43 mm

Factor of Safety (FOS): 1.9



VALIDATION OF CHASSIS



LIMITATIONS ON RULEBOOKS

length	: 80 inch
width	: 60 inch
frame material shape	: Tubular frame
material type	: seamless
minimum material OD	: 1 inch
minimum wall thickness	: 1.5 mm
minimum carbon %	: 0.18%

PARAMETERS ON KART

length	: 73 inch
width	: 52 inch
frame material shape	: Tubular frame
material type	: seamless
material OD	: 1 inch
wall thickness	: 2 mm
carbon %	: 0.3%

STEERING SYSTEM

STEERING CALCULATIONS

STEERING TYPE	: Linkage
INNER STEERING ANGLE	: 27.59 Degree
OUTER STEERING ANGLE	: 17.95 Degree
TURNING CIRCLE RADIUS	: 2.3 m
ACKERMAN PERCENTAGE	: 101.03%

TIE ROD

MATERIAL	: Mild Steel
PITMAN ARM TO LEFT WHEEL	: 30 cm
PITMAN ARM TO RIGHT WHEEL	: 30 cm

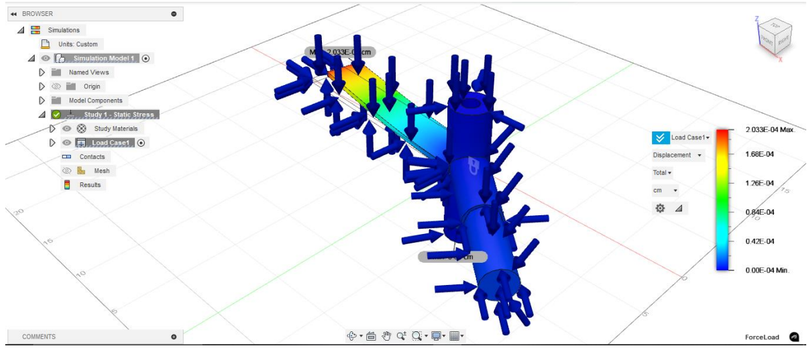
STEERING WHEEL

TYPE	: Ackerman
STEERING WHEEL DIAMETER	: 12 inch
STEERING RATIO	: 1.668:1
LINKAGE TYPE	: Mechanical

PITMAN ARM

MATERIAL	: Mild Steel
TOTAL LENGTH	: 11 cm
TOTAL WIDTH	: 6.5 cm
THICKNESS	: 0.5 cm

STEERING SYSTEM



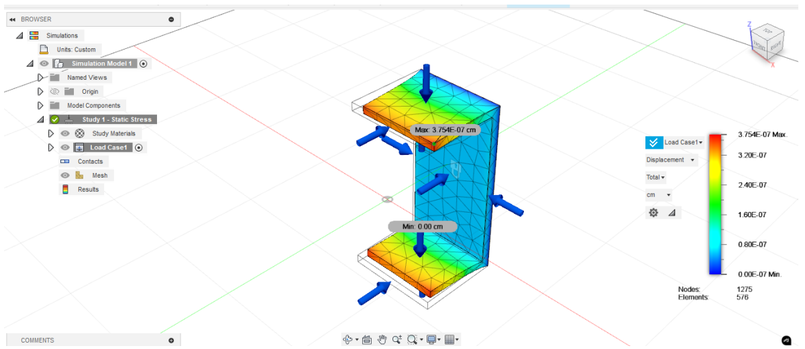
MAX STRESS: 0.03MPA

MAX DISPLACEMENT: 37.5 MM

REACTION FORCE: 1.44N

STRAIN: 2.313E_07

FOS: 15



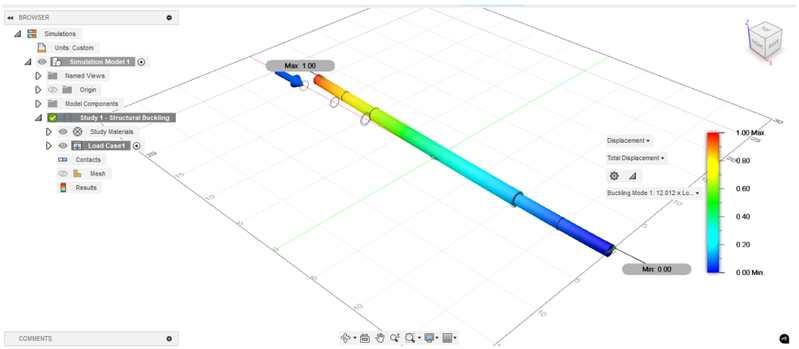
MAX STRESS: 0.15MPA

MAX DISPLACEMENT: 1.877 MM

REACTION FORCE: 7.22 N

STRAIN: 1.156E_06

FOS: 15



MAX STRESS: 10.5 MPA

MAX DISPLACEMENT: 193.83 MM

REACTION FORCE: 119.30N

STRAIN: 8.787E_06

FOS: 15

STEERING SYSTEM ASSSEMBLY

3D MODEL & VALIDATION

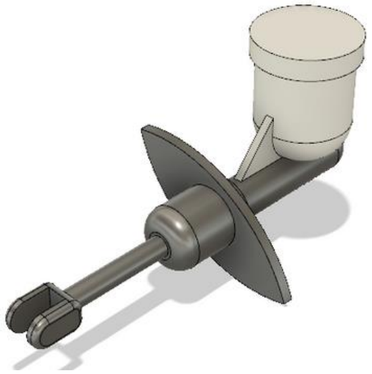
LIMITATIONS ON RULEBOOKS

POSITIVE STEERING STOPS
MAX TURNING RADIUS : 2.5m
MIN WHEEL BASE : 36 inch
MAX WHEEL BASE : 60 inch
MAX TRACK WIDTH : 50 inch
MECHANICAL CONNECTIONS

PARAMETERS ON KART

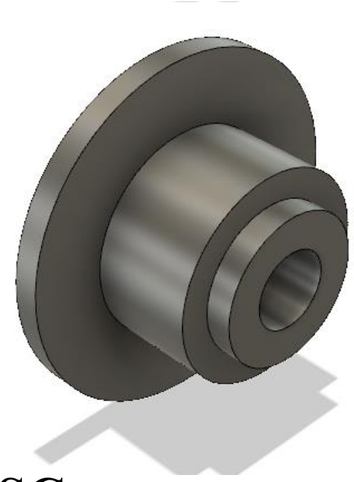
POSITIVE STEERING STOPS ON ACKERMAN
TURNING RADIUS : 2.3m
WHEEL BASE : 37 inch
TRACK WIDTH : 42 inch (Rear track)
MECHANICAL CONNECTIONS

BRAKE SYSTEM



GENERAL

TYPE OF BRAKE SYSTEM	: HYDRAULIC
BRAKE FLUID	: DOT 3
TUBE TYPE	: METAL HOSE

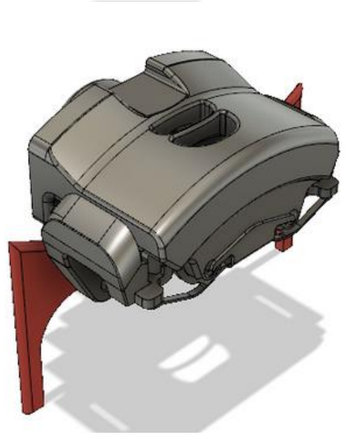


BRAKE DISC

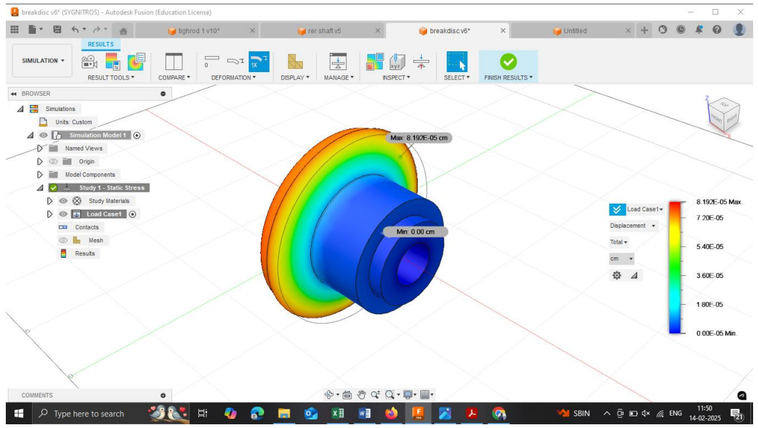
DISC DIAMETER	: 210 mm
DISC THICKNESS	: 13 mm
MATERIAL	: STAINLESS STEEL

CALIPER & ACTUATOR

CALIPER USED	: ALTO 800
CALIPER MATERIAL	: IRON
ACTUATOR USED	: LANCER CLUTCH
MASTER CYLINDER BORE SIZE	: 13 mm

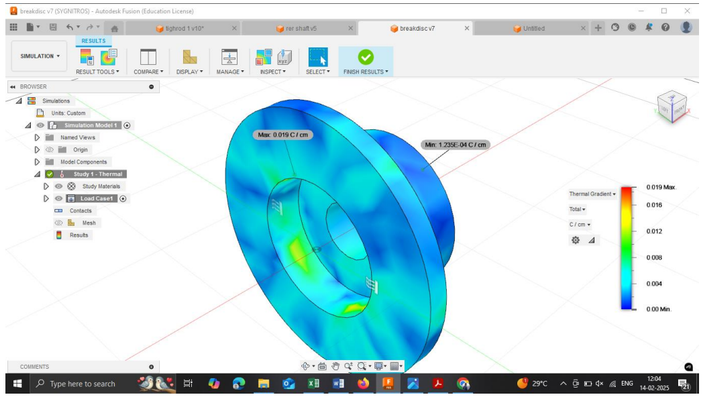


BRAKE CALCULATIONS



- **THERMAL CONDUCTIVITY (K):** ~50 W/M·K
- **DENSITY (P):** ~7200 KG/M³
- **SPECIFIC HEAT (C):** ~460 J/KG·K
- **HEAT FLUX :** 0.003 J / S CM²
- **THERMAL GRADIENT :** 0.019 C / CM

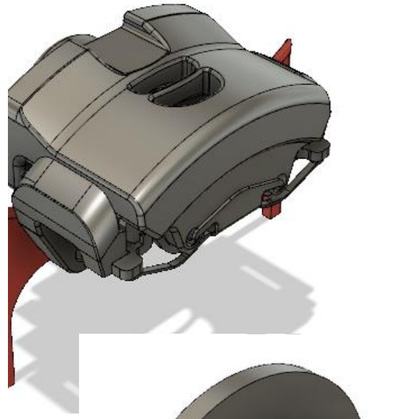
Boundary Condition	Value/Range
Heat Flux	30,000 W/m²
Convection Coefficient	40 W/m²·K
Ambient Temp	25°C
Initial Temp	25°C
Material	Cast Iron or Steel (with k, ρ, c)

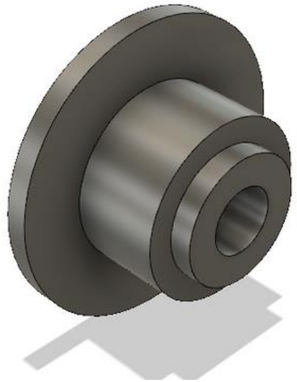


BRAKE CALCULATIONS

- BRAKE PEDAL RATIO : 4:1
- STOPPING DISTANCE AT MAX SPEED : 47.35 m
- DECELERATION : -5.88 m/s
- STOPING TIME : 4.01 seconds
- BRAKING FORCE : 2540.16 N
- BRAKE TORQUE : 228.61 N.m

- FORCE ON CYLINDER : 1373.4 N
- DISC Dia REQUIRED : 20 cm
- MASTER CYLINDER PRESSURE : 190 x 10^-4 m^2
- PRESSURE INSIDE BRAKE LINE : 109.34 Pa
- FRICTION BTW BRAKE CALIPER PAD AND DISC : 1.9
- FRICTION BTW BRAKE TYRE AND ROAD : 0.6 µ





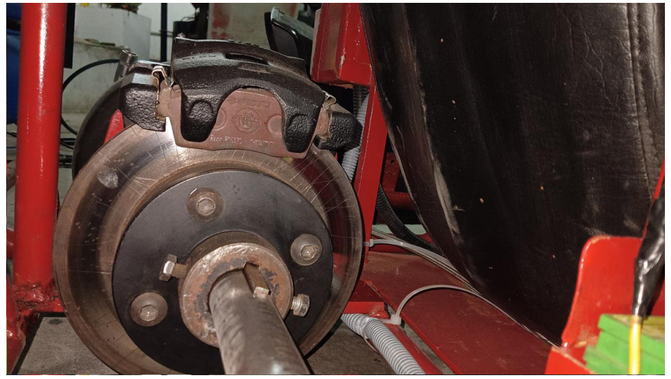
BRAKE VALIDATION

LIMITATIONS ON RULEBOOKS

- THE KART SHOULD HALT WITHN 25m FROM A SPEED OF 45 km/h
- ABLE TO LOCK TO LOCK WHEEL COMPETELY AT MAX SPEED
- HYDRAULIC BRAKES MUST BE USED
- CONNECTED ONLY TO REAR WHEEL
- ONLY FOOT OPERATIONS

PARAMETERS ON KART

- STOPPINS DISTANCE AT 45 km/h IS 17.43 m
- THE WHEEL LOCKS COMPLETELY
- HYDRAULIC BRAKES IS USED
- CONNECTED ON REAR SHAFT
- FOOT OPERATIONS ONLY



POWER TRAIN

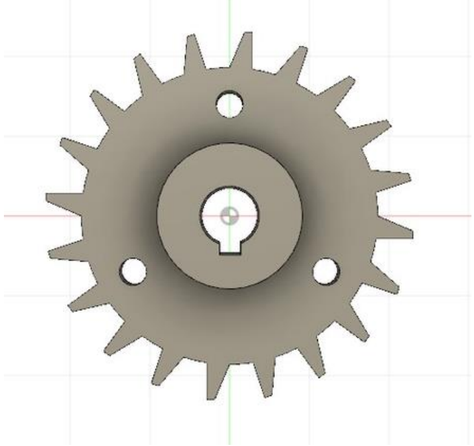
ENGINE

ENGINE DISPLACEMENT	: IC : 149 CC
MAX POWER	: 17 HP (8500 RPM)
MAX TORQUE	: 15 NM (7500 RPM)
NO OF CYLINDER	: 1
NO OF GEAR	: 6
STROKE TYPE	: 4
COOLANT TYPE	: LIQUID

REAR SHAFT

DIAMETER : 3 cm

MATERIAL : mild steel



GEARS

ENGINE SPROCKET TEETH No	: 15
FINAL GEAR TEETH No	: 30
DRIVE RATIO	: 2 : 1

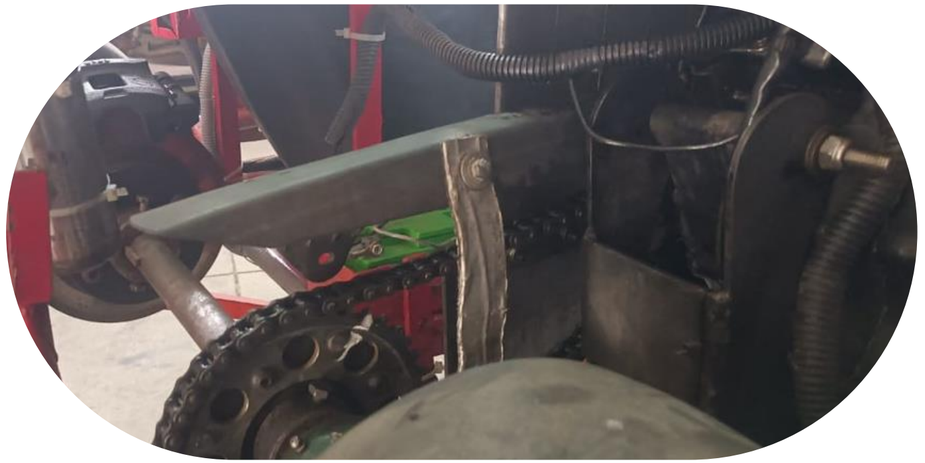
ELECTRICALS

- **Battery (12V Li-ion/Lead Acid)** – Powers the ignition system, cooling fan, and brake lights.
- **Self-Start System** – Uses a push-button ignition to start the engine efficiently.
- **Kill Switch** – Ensures driver safety by cutting off engine power in emergencies.
- **Brake Light** – Improves visibility and safety by indicating braking actions.
- **Cooling Fan** – Maintains optimal engine temperature, preventing overheating.
- **Choke Switch** – Aids in cold starts by adjusting the air-fuel mixture

POWER TRAIN &
ELECTRICAL VALIDATION

LIMITATIONS ON RULEBOOKS

- ENGINE BASED TRANSMISSION
- MAXIMUM SPEED 90 Km / hr
- MUST BE PROTECTED WITH GAURD
- ALL WIRING MUST BE ABOVE FLOOR MEMBRANE
- FUSE MUST BE USED



PARAMETERS OF KART

- ENGINE BASED TRANSMISSION
- MAXIMUM SPEED 85 Km / hr
- PROTECTED WITH GAURD
- NO WIRING IS DONE UNDER FLOOR MEMBRANE
- 10 A FUSE IS USED

SAFETY & ERGONOMICS

- **Kill Switch** – Emergency engine shut-off to prevent accidents (2 nos in kart).
- **Brake Kill Switch** – Cuts engine power if brakes are applied forcefully (1 in kart).
- **Brake Light –** Improves visibility and enhances track safety (On Rear).
- **Fire Wall** – Protects the driver from engine heat and fuel leaks. (2 layer of 2mm Al sheet & 3 layer of Duct tape).
- **Bumpers** – Absorbs impact and enhances crash protection.

DESIGN FAILURE MODE AND EFFECTS ANALYSIS.

CAUSE:

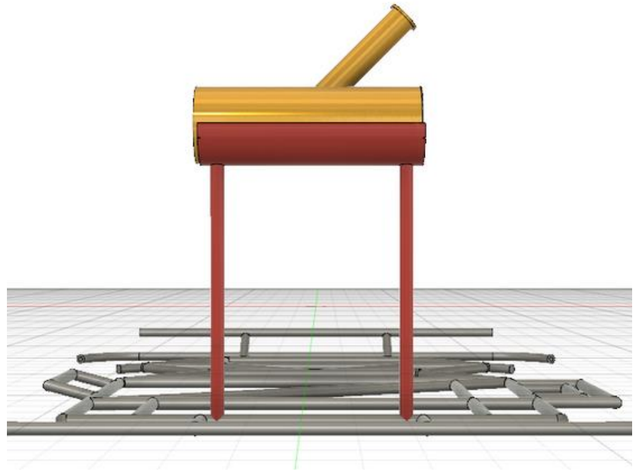
The fuel tank in the kart is placed slightly higher on the kart.

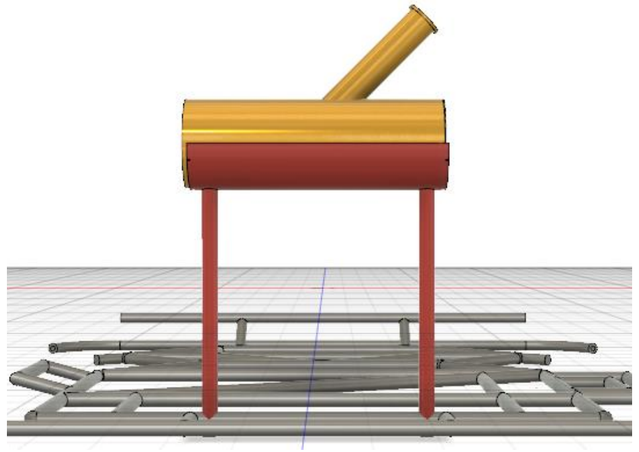
EFFECT:

The fuel inside the tank is push the tank forward and backside when the kart is going on high speed.So that it may results in the weakening of joints.

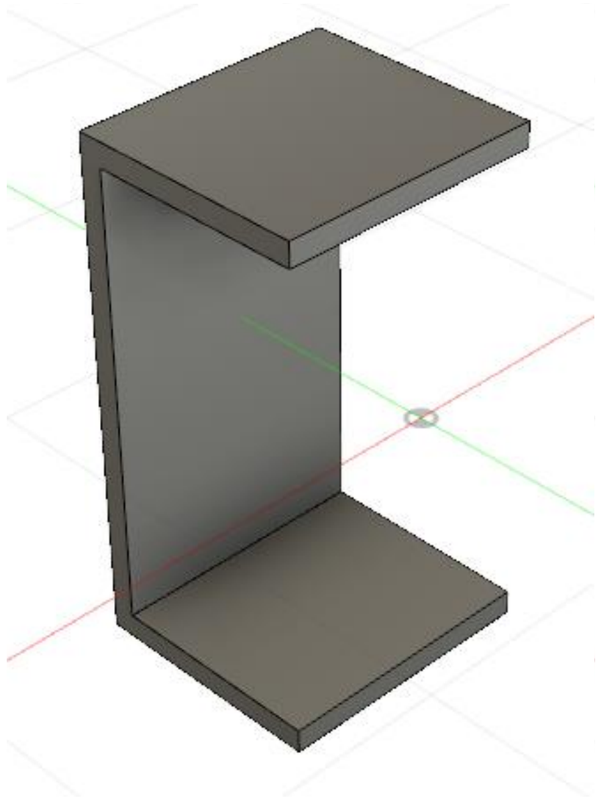
RECTIFIED:

By placing the fuel tank by slightly lower to the kart can reduce tank mount movement.





PROCESS FAILURE MODE AND EFFECTS ANALYSIS.



CAUSE:

- The C-clamp might not be positioned at the correct angle.
- Improper alignment could occured

EFFECT:

- If the C-clamp is incorrectly angled, it may not apply the necessary force evenly, leading to unstable or inefficient performance.

RECTIFIED:

- Proper Alignment: Once the correct angle is identified, ensure that the C-clamp is installed according to these specifications. This could involve using measuring tools like protractors, digital angle finders, or custom jigs to ensure accuracy.

PROCESS FAILURE MODE AND EFFECTS ANALYSIS.

CAUSE:

- The supporting link for the brake system was not set at the correct angle, which prevented proper actuation of the brake piston.

EFFECT:

- This led to improper braking functionality, which could affect safety and performance, such as poor braking force and control.

RECTIFIED:

- Correct the angle of the supporting link so that the brake piston functions properly, ensuring efficient braking and safety.

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THANK YOU

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