MAJOR PROJECT

REPORT ON

DESIGN & FABRICATION OF CHASSIS FOR TELESCOPING 3-WHEEL GO-KART

A Main-project report submitted in partial fulfilment of the requirements for the award of the degree of

Bachelor of Technology in Mechanical Engineering

By

K. TEJARAM	**-**	**20671A0318**
RATHOD YUVRAJ	**-**	**20671A0327**
M. RAMANA REDDY	**-**	**20671A0321**
M. NIKHIL YADAV	**-**	**20671A0320**
CH. V. BHARGAVA SAI REDDY	**-**	**20671A0332**

Under the guidance of

Mr. J. NAGARAJU

Assistant Professor

DEPARTMENT OF MECHANICAL ENGINEERING
J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

May 2024

CERTIFICATE

This is to certify that the thesis / dissertation entitled **"FABRICATION OF CHASSIS FOR TELESCOPING OF 3-WHEEL GO-KART"** is being submitted by Sri / Smt. **K.TEJARAM (20671A0318), RATHOD YUVRAJ (20671A0327), M. NIKHIL YADAV (20671A0320), M. RAMANA REDDY (20671A0321), CH. V. BHARGAVA SAI REDDY (20671A0332),** in partial fulfilment for the award of **Bachelor of Technology in Mechanical Engineering** to the **J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)** is a record of bonafide work carried out by him / her under our guidance and supervision.

The results embodied in this thesis are original work and have not been submitted to any other University or Institute for the award of any degree or diploma.

Signature of Supervisor
Mr. J. NAGARAJU
Assistant Professor
Department of Mechanical Engineering

Signature of Head of the Department
Dr. ANOOP KUMAR SHUKLA
Professor & HOD
Department of Mechanical Engineering

EXTERNAL EXAMINER

TABLE OF CONTENTS

ACKNOWLEDGEMENT

This work is not an individual contribution till its completion. We take this opportunity to thank all for bringing it close to the conclusion. First of all, we would like to thank our guide **Mr. J. Nagaraju, Assistant Professor** for continuously assessing our work providing great guidance by timely suggestions and discussion at every stage of this work. Thanks to, **Dr. Anoop Kumar Shukla, Head of Department of Mechanical Engineering** for providing all facilities without which this seminar work would not have been possible. We sincerely thank to **Mrs. P. Seema Rani, Assistant Professor** for her guidance. I would like to express my gratitude towards my parents & other faculty members of J.B. Institute of Engineering & Technology for their kind co-operation and encouragement which helped me in competition of this project. My thanks and appreciations also go to my copeers in assisting with different aspects of the project and people who willingly helped me out with their best of abilities.

DECLARATION

We **K.TEJARAM (20671A0318), RATHOD YUVRAJ (20671A0327), M. NIKHIL YADAV (20671A0320), M. RAMANA REDDY (20671A0321), CH. V. BHARGAVA SAI REDDY (20671A0332**), hereby solemnly affirm that the main-project report entitled "**DESIGN & FABRICATION OF CHASSIS FOR TELESCOPING OF 3-WHEEL GO-KART"**, being submitted by me in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology in Mechanical Engineering, to the J.B. Institute of Engineering & Technology, is a record of bonafide work carried out by me under the guidance of **Mr. J. NAGARAJU, Assistant Professor**. The work reported in this report in full or in part has not beensubmitted to any University or Institute for the award of any degree or diploma.

Place: HYDERABAD

Date:

K. TEJARAM (20671A0318)

RATHOD YUVRAJ (20671A0327)

M.RAMANA REDDY (20671A0321)

M. NIKHIL YADAV (20671A0320)

V. BARGAVA SAI REDDY (20671A0332)

ABSTRACT

Most of the recreation parks are using 4-wheel petrol (or) diesel powered go-carts which are expensive, heavy in weight and pollutes the environment. As the fossil fuels are depreciating and cost of the fuels is also increasing rapidly in global markets, it is very much essential to develop new go-kart designs with less weight, runs on electric energy (battery) so that it is not dependent on costly imported fuels like petrol / diesel and also consumes less energy.

3 Wheel electric (battery powered) Go Kart is one of the less weight designs that consumes less energy and adds no pollution to the environment. As a part of our project dissertation, we are planning to fabricate chassis for telescopic 3-wheel go-kart.

Telescopic 3-wheel go-kart has fallowing advantages when compared to 4-wheel 2-seater go-karts;

- Less in mass hence gives good energy economy
- No pollution
- Easy to transport as it occupies less space

Project Involves;

- Study of various types of chassis, materials used for chassis, structural elements like pipes, plates and flats, fabrication operations like welding, cutting, drilling, etc.,
- Preparation of design
- Fabrication and assembly
- Preparation of work book

LIST OF TABLES

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

A go-kart, also written as go-cart (often referred to as simply a kart), is a type of open-wheel car. Go-karts come in all shapes and forms, from motor less models to high-powered racingmachines. Some, such as Super-karts, are able to beat racing cars or motorcycles on long circuits.

Gravity racers, usually referred to as Soap Box Derby carts, are the simplest type of go-karts. They are propelled by gravity.

Many recreational karts can be powered by four-stroke engines, while racing karts use a two-stroke or, rarely, higher powered four-stroke engines. Most of them are single seater but some recreational models can accommodate a passenger.

In some countries, go-karts can be licensed for use on public roads often referred to as street tracks. Typically, there are some restrictions; in the European Union, a go-kart modified for use on the road must be outfitted with headlights (high/low beam), tail lights, a horn, indicators, and an engine not exceeding 20 hp (15 kW).

Besides traditional kart racing, many commercial enterprises offer karts for rent, often called "recreational" or "concession" karts. The tracks can be indoor or outdoor. Karts are rented by sessions (usually from 10 to 30 minutes). They use sturdy chassis complete with dedicated bodywork, providing driver safety. Most of these enterprises use an "Arrive and Drive" format which provides customers with all the safety gear (helmets, gloves and driver outfits) necessary, and allow them to show up anytime to race at a reasonable price, without the problem of having to own their own equipment and gear.

Outdoor tracks can offer low-speed karts strictly for amusement (dedicated chassis equipped with low powered four-stroke engines or electric motors), or faster, more powerful karts, similar to a racing kart, powered by four-stroke engines up to 15 hp (11 kW) and, more rarely, by 2-stroke engines, but designed to be more robust for rental use. Typically, outdoor tracks are also be used for traditional kart races.

Indoor kart tracks can be found in many large cities in different parts of the world. These tracks are often located in refurbished factories or warehouses, and are typically shorter than traditional outdoor tracks. Indoor karts are usually powered by a four-stroke gasoline engine producing anywhere from 5 to 13 hp (4 to 10 kW), or sometimes by an electric motor. Many tracks offer competitive races and leagues. At the top level, an Indoor Karting World Championship (IKWC) exists.

Power is transmitted from the engine to the rear axle by way of a chain (some rentals use a belt). Four-stroke engines can be standard air-cooled industrial based engines, sometimes with small modifications, developing from about 5 to 20 hp (4 to 15 kW). Briggs & Stratton, Tecumseh (company closed in 2008), Kohler, Robin, and Honda are manufacturers of such engines. They are adequate for racing and fun kart applications. There are also more powerful two-stroke engines available from manufacturers like Yamaha, KTM, Biland, or Aixro (Wankel engine) offering from 15 to 48 hp (11 to 36 kW). They run at up to 11,000 rpm, and are manufactured specifically for karting. PRD makes the PRD Fireball, a two-stroke engine delivering 28.5 hp (21 kW) at 15,580 rpm.

Electric go-karts are low maintenance, requiring only that the lead-acid or lithium- polymer batteries of the karts be plugged into an array of chargers after each run. Since they are pollution-free and emit no smoke, the racetracks can be indoors in controlled environments.Electric karts powered by lead-acid batteries can run a maximum of 20-30 minutes before performance is affected, while those powered by lithium batteries may last up to 1 to 2 hours ona single charge. Some karts have been fitted with hydrogen fuel cells.

Nowadays most of the racers are using 4-wheel petrol (or) diesel powered go-carts which are expensive, heavy in weight and pollutes the environment. As the fossil fuels are depreciating and cost of the fuels is also increasing rapidly in global markets, it is very much essential to develop new go-karts with less weight, runs on electric energy / battery so that it is not dependent on costly imported fuels like petrol / diesel and consumes less energy

3 Wheel electric (battery powered) go-kart is one of the less weight designs that consumes less energy and adds no pollution to the environment. Through this project we have made an effort to make less weight 3 wheel go kart chassis which can take 200Kgs Load (50kg Chassis+150Kg Men) and also support parts like motor, batteries, steering, controller etc., this chassis also accommodates retractable seat for passenger making it a 2-seater go-kart.

1.2 GRINDING CUTTER MACHINE: -

A grinding cutter machine as shown in figure (2.21), is any of various power tools or machine tools used for grinding, which is a type of machining using an abrasive wheel as the cutting tool. Each grain of abrasive on the wheel's surface cuts a small chip from the work piece via shear deformation. Grinding is used to finish work pieces that must show high surface quality (e.g., low surface roughness) and high accuracy of shape and dimension. As the accuracy in dimensions in grinding is of the order of 0.000025 mm, in most applications it tends to be a finishing operation and removes comparatively little metal, about 0.25 to 0.50 mm depth.

Hand Grinder cum Cutting Machine	
Voltage	220 V
Frequency	50 Hz
Power Source	Electric
Weight	2-3 kg
Surface Finishing	Color Coated
Blade Size	4"

Figure (1.3) Grinding cutter machine

1.3 ADIAL ARM DRILLING MACHINE: -

A drill (known in many countries as a drill machine) is a tool fitted with a cutting tool attachment or driving tool attachment, usually a drill bit or driver bit, used for boring holes in various materials or fastening various materials together. The attachment is gripped by a chuckat one end of the drill and rotated while pressed against the target material as shown in figure (2.22). The tip, and sometimes edges, of the cutting tool does the work of cutting into the target material. This may be slicing off thin shavings (twist drills or auger bits), grinding off small particles (oil drilling), crushing and removing pieces of the work piece (SDS masonry drill), countersinking, counter boring, or other operations.

Figure (1.4) Radial arm drilling machine

1.4 WELDING: -

Welding is the process of making permanent joints by using heat, pressure, or both. It's often done on metal, thermoplastics, and even wood. The resulting joint is known as a weldment, and the conjoined parts are known as the parent material. The material used to create the weldment is called a filler or consumable.

Types of Welding:

- Metal Inert Gas (MIG)
- Gas Tungsten Arc Welding (GTAW/TIG)
- Shielded Metal Arc Welding (SMAW)
- Flux Cored Arc Welding (FCAW)

Welding Machine Specifications	
Type of Machine	Arc Welding Machine
Supply Voltage	220 V
Technology	IGBT
Frequency	50 Hz
Phase	1 Phase
Current	250A

Fig 1.5 Welding equipment

CHAPTER-2

LITERATURE REVIEW

2.1. DESIGN AND FABRICATION OF GO-KART: MOHAMMED AL-GARNI

The go-kart is a vehicle that is small, quick, light, and simple to drive. Since the go-kart is designed for flat-track racing, it has a very poor ground clearance relative to most cars, but it does not have suspension. Because of its ease, low cost, and safer way of racing, go-karting is a perfect outlet for those involved in racing. It is possible to have an indoor or outdoor track. The go-kart tracks are much smoother than the F1 tracks.

Go kart design by Mohammed Al-Garner

2.2. DESIGN AND FABRICATION OF AN ELECTRIC GO-KART: MORISHO P. JENNY

Electric vehicles have been around since car manufacturing began. Robert Davidson in Scotland created the first functional electric vehicle, a 16-foot (4.9 meter) truck powered by electro-magnetic motors, in 1837.

With this growing interest in electric vehicles and the numerous benefits they have on the environment and the economy at large, in this project we want to take a deeper look at the design and manufacturing of an electric go-kart.

2.3. WILL A GO-KART FIT IN A CAR PUBLSIHED BY RIROO?

When it comes to go-kart transportation, it's not just about fitting it into a car. It's about understanding the dimensions and requirements of the go-kart, the available vehicle space, and finding the right transport solutions.

Every go-kart has its unique dimensions, and every car has its capacity. It's essential to measure and match these before deciding on a transportation method which will add additional expensive for carrying Go-Kart in vehicle.

2.1. CHASSIS

A chassis is the basic framework of your vehicle. Sometimes the **chassis** is only the frame, while other times it includes the wheels, transmission, and sometimes even the front seats. A **chassis** isone of the most important components of a vehicle, without which the **car** would have no structure as shown in figure (2.1.1).

Figure (2.1.1) Chassis

2.1. History and Development of Vehicle Chassis

Coupe French car manufacturer “Poniard” used body panels entirely made of aluminum to dress the “Dana”. In the past few years manufacturer is increasingly using the expensive aluminum for their vehicle bodies. 72 years after the introduction of Dodge’s all-steel body, the Car Manufacturer Audio (in cooperation with the Aluminum Company of America (Alcoa)) was finally able to develop an equivalent in Aluminum. The Audio Aluminum Space Frame, used in the AAA, is the first car to be fitted with a chassis and Fig. 2: Audio Space Frame body made from 100% aluminum. The main reason to use aluminum or fiberglass Instead of steel is to save weight.

In 1953 Chevrolet Introduced the Corvette with a fiberglass body. The corvette wasn’t the first car to use fiberglass, but Chevrolet was the first big manufacturer who used this material in a series production. In 1957 Lotus succeeded in building a fiberglass monocle chassis for the Elite.

It would remain the only car ever built with a complete fiberglass chassis, as the imprecision caused by the manufacturing process caused every car to be built with a loss.

Fiber glass was common to be used for sports cars or kit cars that were produced in limited quantities. It is inexpensive to create moulds and fiberglass is easy to work with. However, it is very difficult to achieve small tolerances in the fitting accuracy. The gaps of the panels are bigger and where small tolerances are needed (I. E. Suspension or engine mountings) the required measurements can hardly be met. Engineers found the solution in using a rugged chassis onto which the fiber glass fiber glass body was glued to an Aluminium Frame.

Until the 1930s virtually every car had a structural frame, separate from its body. This construction design is known as body-on-frame. Over time, nearly all passenger cars have migrated to body construction, meaning their chassis and bodywork have been integrated into one another.

2.2. Function of chassis

The main functions of a frame in motor vehicles are:

1. To support the vehicle's mechanical components and body
2. To deal with static and dynamic loads, without undue deflection or distortion.

These include:

- Weight of the body, passengers, and cargo loads.
- Vertical and torsion twisting transmitted by going over uneven surfaces.
- Transverse lateral forces caused by road conditions, side wind, and steering the vehicle.
- Torque from the engine and transmission.
- Longitudinal tensile forces from starting and acceleration, as well as compression from braking.
- Sudden impacts from collisions.

Types of frames according to the construction:

- Ladder type frame
- X-Type frame
- Offset frame
- Off set with cross member frame

- Perimeter Frame

2.3. Frame and Rails

Typically, the material used to construct vehicle chassis and frames is carbon steel; or aluminium alloys to achieve a more light-weight construction. In the case of a separate chassis, the frame is made up of structural elements called the rails or beams. These are ordinarily made of steel channel sections, made by folding, rolling or pressing steel plate.

C-shape

By far the most common, the C-channel rail has been used on nearly every type of vehicle at one time or another. It is made by taking a flat piece of steel (usually ranging in thickness from 1/8" to 3/16", but up to 1/2" or more in some heavy-duty trucks) and rolling both sides over to form a C-shaped beam running the length of the vehicle as shown in figure (4.1.2).

Figure (2.1.2) C-Shape frame rail

Hat

Hat frames resemble a "U" and may be either right-side-up or inverted with the open area facing down. Not commonly used due to weakness and a propensity to rust, however they can be found on 1936–1954 Chevrolet cars and some Studebakers.

Abandoned for a while, the hat frame gained popularity again when companies started welding it to the bottom of unibody cars, in effect creating a boxed frame.

Boxed

Originally, boxed frames were made by welding two matching C-rails together to form a rectangular tube. Modern techniques, however, use a process similar to making C-rails in that a piece of steel is bent into four sides and then welded where both ends meet as shown in figure (4.1.3).

Figure (2.1.3) boxed frame rail

In the 1960s, the boxed frames of conventional American cars were spot-welded here and there down the seam; when turned into NASCAR "stock car" racers, the box was continuously welded from end to end for extra strength.

2.4. TYPES OF CHASSIS

Ladder frame:

So, named for its resemblance to a ladder, the ladder frame is one of the simplest and oldest of all designs. It consists of two symmetrical beams, rails, or channels running the length of the vehicle, and several transverse cross-members connecting them as shown in figure (4.1.4). Originally seen on almost all vehicles, the ladder frame was gradually phased out on cars in favor of perimeter frames and unitized body construction. It is now seen mainly on trucks. This design offers good beam resistance because of its continuous rails from front to rear, but poor resistance to torsion or warping if simple, perpendicular cross-members are used. Also, the vehicle's overall height will be greater due to the floor pan sitting above the frame instead of inside it.

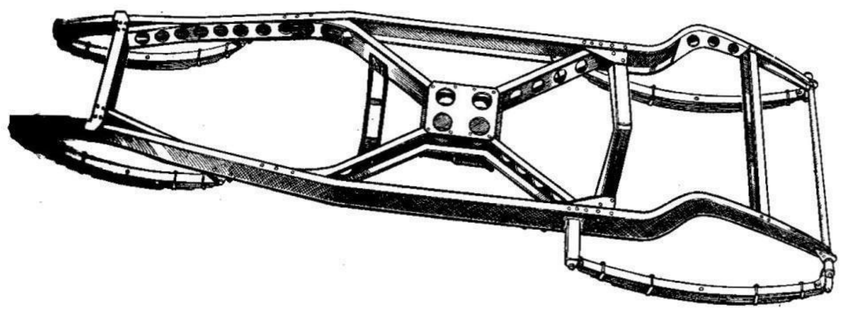

Figure (2.1.4) Ladder frame

Unit body:

The term **unibody** or **unit body** is short for **unitized body**, or alternatively unitary construction design. It is a type of body/frame construction in which the body of the vehicle andits floor plan and chassis form a single structure. Such a design is generally lighter and more rigid than a vehicle having a separate body and frame as shown in figure (4.1.5).

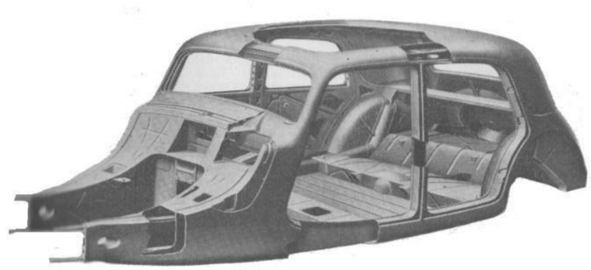

Figure (2.1.5) Unit body

Traditional body-on-frame architecture has shifted to the lighter unitized body structure that is now used on most cars.

Integral frame and body construction require more than simply welding an unstressed body to a conventional frame. In a fully integrated body structure, the entire car is a load-carrying unit that handles all the loads experienced by the vehicle—forces from driving as well as cargo loads. Integral-type bodies for wheeled vehicles are typically manufactured by welding preformed metal panels and other components together, by forming or casting whole sections as one piece, or by a combination of these techniques. Although this is sometimes also referred to as a monologue structure, because the car's outer skin and panels are made load-bearing, there are still ribs, bulkheads and box sections to reinforce the body, making the description semi-monologue more appropriate.

The first attempt to develop such a design technique was on the 1922 Lancia Lambda to provide structural stiffness and a lower body height for its torpedo car body. The Lambda though its open layout, with unstressed roof, made it less a monologue shell and more a bowl - 11,000 were produced.

A key role in developing the unitary body was played by the American firm the Budd Company, now ThyssenKrupp Budd. Budd supplied pressed-steel bodywork, fitted to separate frames, to automakers Dodge, Ford, Buick, and the French company, Citroën.

In 1930, Joseph Ledwinka, an engineer with Budd, designed an automobile prototype with full unitary construction as shown in figure (4.1.5).

Citroën purchased this fully unitary body design for the Citroën Traction Avant. This high volume, mass production car was introduced in 1934 and sold 760,000 units over the next 23 years of production. This application was the first iteration of the modern structural integration of body and chassis, using spot welded deep stamped steel sheets into a structural cage, including sills, pillars and roof beams. In addition to a unitary body with no separate frame, the Traction Avant also featured other innovations such as four-wheel independent suspension, and front-wheel drive. The result was a low-slung vehicle with an open, flat-floored interior.

For the Chrysler Airflow (1934–1937) Budd supplied a variation - three main sections from the Airflow's body were welded into what Chrysler called a bridge-truss construction. For the Chrysler Airflow unfortunately, this method was not ideal - panel fits were poor. To convince a skeptical public of the strength of unibody both Citroën and Chrysler created advertising films showing cars surviving after being pushed off a cliff.

Opel was the second European and the first German car manufacturer to produce a car with unibody structure - production of the compact Olympia started in 1935. A larger Kapitän went into production in 1938, although its front longitudinal beams were stamped separately and then attached to the main body.

The streamlined 1936 Lincoln-Zephyr with conventional front-engine, rear-wheel-drive layout utilized a unibody structure. By 1941, unit construction was no longer a new idea for cars,"but it was unheard of in the [American] low-price field and Nash wanted a bigger share of thatmarket." The single unit body construction of the Nash 600 provided weight savings and Nash'sChairman and CEO, George W. Mason was convinced "that unibody was the wave of the future."

Since then more cars were redesigned to the unibody structure, which is now "considered standard in the industry". By 1960, unitized body design was used by Detroit's Big Three on their compact cars (Ford Falcon, Plymouth Valiant, and Chevrolet Corsairs). After Nash merged with Hudson Motors to form American Motors, its Rambler-badged automobiles continued exclusively building variations of the unibody.

Although the 1934 Chrysler Airflow had a weaker than usual frame and body framework welded to the chassis to provide stiffness, in 1960, Chrysler moved from body-on-frame construction to a unit-body design for most of its cars as shown in figure (4.1.6).

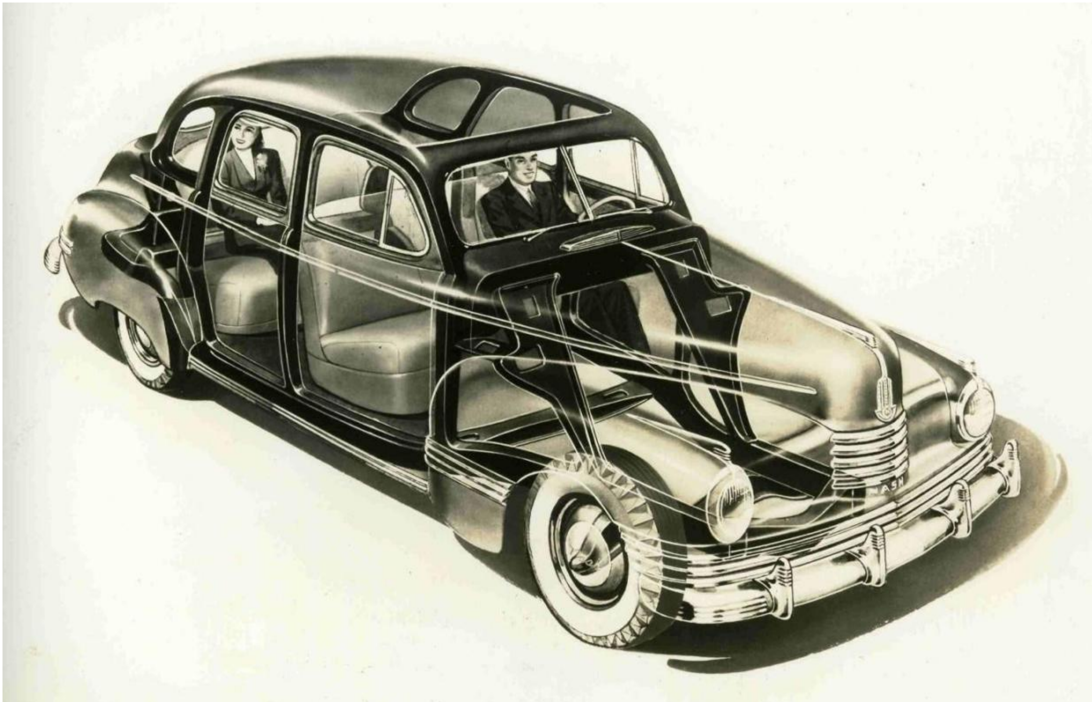

Figure (2.1.6) 1960’s body frame

Most of the American-manufactured unibody automobiles used torque boxes in their vehicle design to reduce vibrations and chassis flex, with the exception of the Chevy II which had a bolt-on front apron (erroneously referred to as a subframe). American Motors (with its partner Renault) during the late-1970s incorporated unibody construction when designing the Jeep Cherokee (XJ) platform using the manufacturing principles (inside, floor pan with integrated frame rails and crumple zones, and roof panel) used in its passenger cars, such as the Hornets and all-wheel-drive Eagles for a new type of frame called the uniframe as shown in figure (4.1.7).

Figure (2.1.7) 1970’s frame

A robust stamped steel frame welded to a strong unit-body structure, giving the strength of a conventional heavy frame with the weight advantages of Unibody construction." This design was also used with the XJC concept developed by American Motors prior to its absorption by Chrysler, which later became the Jeep Grand Cherokee (ZJ) —including modern day sport utility vehicles (Jeep Grand Cherokee.

The unibody is now the preferred construction for mass market automobiles and crossovers. This design provides weight savings, improved space utilisation, and ease of manufacture.

Acceptance grew dramatically in the wake of the two energy crises of the 1970s, and that of the 2000s in which compact SUVs using a truck platform (primarily the USA market) were subjected to CAFE standards as shown in figure (4.1.8).

Figure (2.1.8) 2000’s frame

After 2005 (by the late-2000s truck-based compact SUV’s were phased out and replaced with crossovers). An additional advantage of a strong-bodied car lies in the improved crash protection for its passengers.

Backbone chassis:

Backbone tube chassis is a type of automobile construction chassis that is similar to the body- on-frame design. Instead of a two-dimensional ladder-type structure, it consists of a strong tubular backbone (usually rectangular in cross section) that connects the front and rear suspension attachment areas as shown in figure (4.1.9). A body is then placed on this structure. It was first used in the English Rover 8hp of 1904 and then the French Simplicia automobile in 1909.

The backbone chassis was extensively developed by Hans Ledwinka who used it in greater numbers on the Tatra 11 and subsequent vehicles. Ledwinka later used backbone frame with central tube and axles with swinging driveshafts on Tatra trucks, became known as Tatra- concept.

Figure (2.1.9) Backbone chassis

X Frame:

This is the design used for the full-size American models of General Motors in the late 1950s and early 1960s in which the rails from alongside the engine seemed to cross in the passenger compartment, each continuing to the opposite end of the cross member at the extreme rear of the vehicle as shown in figure (4.1.10).

Figure (2.1.10) X Frame

It was specifically chosen to decrease the overall height of the vehicles regardless of the increase in the size of the transmission and propeller shaft humps, since each row had to cover frame rails as well. Several models had the differential located not by the customary bar between axle and frame, but by a ball joint atop the differential connected to a socket in a wishbone hinged onto a cross member of the frame.

The X-frame was claimed to improve on previous designs, but it lacked side rails and thus did not provide adequate side-impact and collision protection. This design was replaced by perimeter frames.

Perimeter frame:

Similar to a ladder frame, but the middle sections of the frame rails sit outboard of the front andrear rails just behind the rocker / sill panels. This was done to allow for a lower floor pan, especially at the passenger footwells, to lower the passengers' seating height and therefore reducethe overall vehicle height in passenger cars. This became the prevalent design for body-on- frame cars in the United States, but not in the rest of the world, until the uni-body gained popularity. It allowed for annual model changes introduced in the 1950s to increase sales, but without costly structural changes as shown in figure (4.1.11).

Figure (2.1.11) Perimeter frame

As of 2014, there are no perimeter frame automobiles sold in the United States after the Ford Motor Company phased out the Panther platform in 2011, which ended the perimeter frame passenger car in the United States (the Chevrolet Corvette has used a variation of the perimeter frame since 1963, but its fourth-generation variant to its current generation as of 2016 has elements of the perimeter frame integrated with an internal endoskeleton which serves as a clamshell).

In addition to a lowered roof, the perimeter frame allows lower seating positions when that is desirable, and offers better safety in the event of a side impact. However, the design lacks stiffness, because the transition areas from front to center and center to rear reduce beam and torsional resistance, and is used in combination with torque boxes and soft suspension settings.

Platform frame:

This is a modification of the perimeter frame, or of the backbone frame, in which the passenger compartment floor, and sometimes also the luggage compartment floor, have been integrated into the frame as load bearing parts, for extra strength and rigidity. Neither floor pieces are simply sheet metal straight off the roll, but have been stamped with ridges and hollows for extrastrength as shown in figure (4.1.12).

Figure (2.1.12) Platform Frame

Platform chassis were used on several successful European cars. The most well-known of this is the Volkswagen Beetle, on which it is called body on pan construction. Another German example are the Mercedes-Benz "Ponton" cars of the 1950s and 1960s, where it was called a "frame floor" in English-language advertisements.

The French Renault 4 of which over eight million were made, also used a platform frame. The frame of the Citroen 2CV represents a more minimal interpretation of a platform chassis.

2.5. MATERIAL:

Mild Steel (MS):

Steel is any alloy of iron as shown in figure (4.2.1), consisting of 0.2% to 2.1% of carbon, as a hardening agent. Besides carbon, many other metals are a part of it. They include chromium, manganese, tungsten and vanadium. Other than a maximum limit of 2% carbon in the manufacture of carbon steel, the proportions of manganese (1.65%), copper (0.6%) and silicon (0.6%) are fixed, while the proportions of cobalt, chromium, niobium, molybdenum, titanium, nickel, tungsten, vanadium and zirconium are not. What is known as mildest grade of carbon steel or mild steel is typically the variety which has a comparatively low amount of carbon

(0.05% - 0.26%).

Mild steel is overwhelming the market demand makes it the cheapest form of steel available. With such widespread usage, the knowledge of its properties is necessary for anybody who's into the manufacturing business or a student of metallurgy. You will find the most important characteristics of mild steel presented in the following lines.

An alloy is a mixture of metals and non-metals, designed to have specific properties. These metallurgical innovations make it possible to compensate for the shortcomings of a pure metal by adding other elements.

Figure (2.2.1) Mild steel

PROPERTIES AND USES: -

Here is a compilation of mild steel properties and its uses in various fields of technology.

• The calculated average industry grade mild steel density is 7861.093 kg/m3. Its Young's modulus, a measure of its stiffness is around 210,000 MPa.

• A moderate amount of carbon makes this steel different from other types. Carbon atoms get affixed in the interstitial sites of the iron lattice, making it stronger and harder. However, the hardness comes at the price of a decrease in ductility.

• Compared to other types of steel, this type is ideal for welding purposes, as it conducts electric current effectively without tarnishing the metal surface in any way.

• Mild steel has ferromagnetic properties, which make it ideal for manufacture of electrical devices and motors. It yields itself easily to magnetization.

• Unlike other grades of carbon steel, which tend to be brittle, mild steel is hard, yet malleable, making it the ideal choice for the construction of pipelines, construction materials and many other daily use products like cookware.

• Mild steel can be machined and shaped easily due to its inherent flexibility. It can be hardened with carburizing, making it the ideal material for producing a range of consumer products.

The high amount of carbon also makes it vulnerable to rust. Naturally, people prefer stainless over mild steel, when they want a rust-free technology. It is also used in construction as structural steel, besides finding applications in the car manufacturing industry.

2.6. Types of materials;

Square pipe:

A hollow square pipe is used for making structural elements for automobiles and a image of square pipe is as shown in figure (2.2.2).

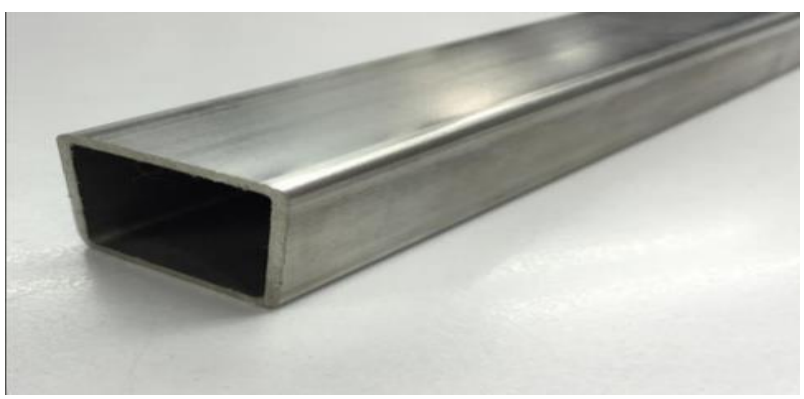

Figure (2.2.2) MS square pipe

Table 1

Square Hollow Section / Square Tubing Dimensions / square tubes weight chart,

Square Tubing Size(mm^2)	**Square Tube Thickness(mm)**	**Square Tubing Kg / Metre**
20 X 20	2	1.11 Square Tube
25 X 25	2	1.43 Square Tube
25 X 25	2.5	1.74 Square Tube
25 X 25	3	2.04 Square Tube
30 X 30	2	1.74 Square Tube
30 X 30	2.5	2.14 Square Tubes
30 X 30	3	2.51 Square Tubes
30 X 30	3.2	2.65 Square Tubes
40 X 40	2	2.37 Square Tubes
40 X 40	2.5	2.92 Square Tubes
40 X 40	3	3.45 Square Tubes
40 X 40	4	4.46 Square Tubes
40 X 40	5	5.40 Square Tubes

Table 2
PRESSURE RATING

AVE. WALL INCHES	MIN YIELD STRENGTH (PSI)	MIN TENSILE STRENGTH (PSI)	THEORETICAL BURST PRESSURE (PSI)	WORKING PRESSURE(PSI) 25% OF BURST	THEORETICAL YIELD POINT (PSI)	COLLAPSE PRESSURE (PSI)
0.250	0.020	30,000	75,000	14,286	3,571	5,714
0.250	0.028	30,000	75,000	21,649	5,412	8,660
0.250	0.035	30,000	75,000	29,167	7,292	11,667
0.250	0.049	30,000	75,000	48,355	12,089	19,342
0.250	0.065	30,000	75,000	81,250	20,313	32,500
0.375	0.020	30,000	75,000	8,955	2,239	3,582
0.375	0.028	30,000	75,000	13,166	3,292	5,266
0.375	0.035	30,000	75,000	17,213	4,303	6,885
0.375	0.049	30,000	75,000	26,534	6,634	10,614
0.375	0.065	30,000	75,000	39,796	9,949	15,918
0.500	0.020	30,000	75,000	6,522	1,630	2,609
0.500	0.028	30,000	75,000	9,459	2,365	3,784
0.500	0.035	30,000	75,000	12,209	3,052	4,884
0.500	0.049	30,000	75,000	18,284	4,571	7,313
0.500	0.065	30,000	75,000	26,351	6,588	10,541
0.500	0.083	30,000	75,000	37,275	9,319	14,910
0.625	0.020	30,000	75,000	5,128	1,282	2,051
0.625	0.028	30,000	75,000	7,381	1,845	2,953

0.625	0.035	30,000	75,000	9,459	2,365	3,784
0.625	0.049	30,000	75,000	13,947	3,487	5,579
0.625	0.065	30,000	75,000	19,697	4,924	7,879
0.625	0.083	30,000	75,000	27,124	6,781	10,850
0.625	0.095	30,000	75,000	32,759	8,190	13,103
0.625	0.109	30,000	75,000	40,172	10,043	16,069
0.750	0.028	30,000	75,000	6,052	1,513	2,421
0.750	0.035	30,000	75,000	7,721	1,930	3,088
0.750	0.049	30,000	75,000	11,273	2,818	4,509
0.750	0.065	30,000	75,000	15,726	3,931	6,290
0.750	0.083	30,000	75,000	21,318	5,330	8,527
0.750	0.095	30,000	75,000	25,446	6,362	10,179
0.750	0.109	30,000	75,000	30,733	7,683	12,293
0.750	0.120	30,000	75,000	35,294	8,824	14,118
0.875	0.020	30,000	75,000	3,593	898	1,437
0.875	0.028	30,000	75,000	5,128	1,282	2,051
0.875	0.035	30,000	75,000	6,522	1,630	2,609
0.049	30,000	75,000	9,459	2,365	3,784	3,172
0.875	0.065	30,000	75,000	13,087	3,272	5,235

0.875	0.083	30,000	75,000	17,560	4,390	7,024
0.875	0.095	30,000	75,000	20,803	5,201	8,321
0.875	0.109	30,000	75,000	24,886	6,221	9,954
0.875	0.120	30,000	75,000	28,346	7,087	11,339
1.000	0.028	30,000	75,000	4,449	1,112	1,780
1.000	0.035	30,000	75,000	5,645	1,411	2,258
1.000	0.049	30,000	75,000	8,149	2,037	3,259
1.000	0.065	30,000	75,000	11,207	2,802	4,483
1.000	0.083	30,000	75,000	14,928	3,732	5,971
1.000	0.095	30,000	75,000	17,593	4,398	7,037
1.000	0.109	30,000	75,000	20,908	5,227	8,363
1.000	0.120	30,000	75,000	23,684	5,921	9,474
1.000	0.134	30,000	75,000	27,459	6,865	10,984
1.250	0.035	30,000	75,000	4,449	1,112	1,780
1.250	0.049	30,000	75,000	6,380	1,595	2,552

2.7. MATERIAL USED AND ITS COMPOSITION

The chassis material is considered depending upon the various factors such as maximum load capacity, absorption force capacity, strength, rigidity. The material selected for the chassis building is AISI 1018. AISI 1018 is a mild/low carbon steel.

Tables:

Composition	**AISI 1018**
Iron	98.8 to 99.25%
Manganese	0.6 to 0.9%
Carbon	0.15 to 0.2%
sulphur	0 to 0.050%
Phosphorus	0 to 0.040%

Table 2.11.1 Composition of AISI 1018

Properties	**AISI 1018**
Density	7.9 g/cm3
Young’s modulus	210 GPa
Elongation at Break	16 to 27 %
Poisson's Ratio	0.3
Tensile Strength: Ultimate (UTS)	430 to 470 MPa
Bulk Modulus	159 GPa
Yield strength	264 MPa
Thermal conductivity	51.9 W/m-k

Table 2.11.2 Properties of AISI 1018

CHAPTER 3

METHODOLGY

3.1 MODELLING & ANALYSIS

Part design of 3-wheel go-kart is performed using CATIA V5 Software. In part design page a square of 40 x 40mm is drawn as shown in Fig 3.1

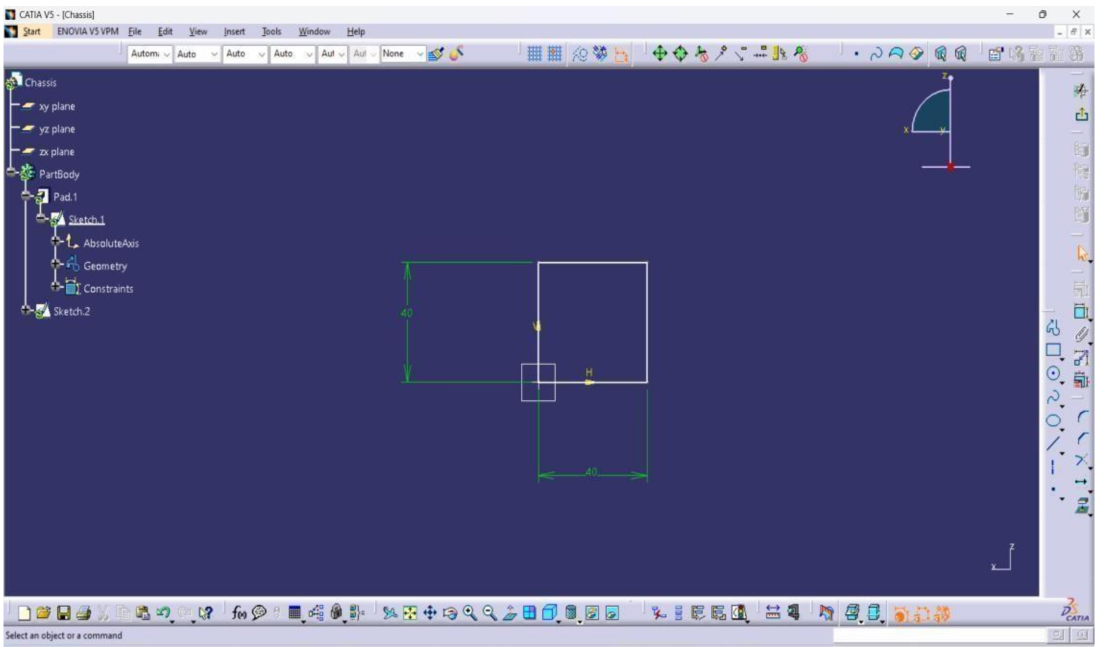

Fig 3.1 Long runner square drawing of chassis

Another square of 40mm x 40mm is drawn using translate option as shown in Fig 3.

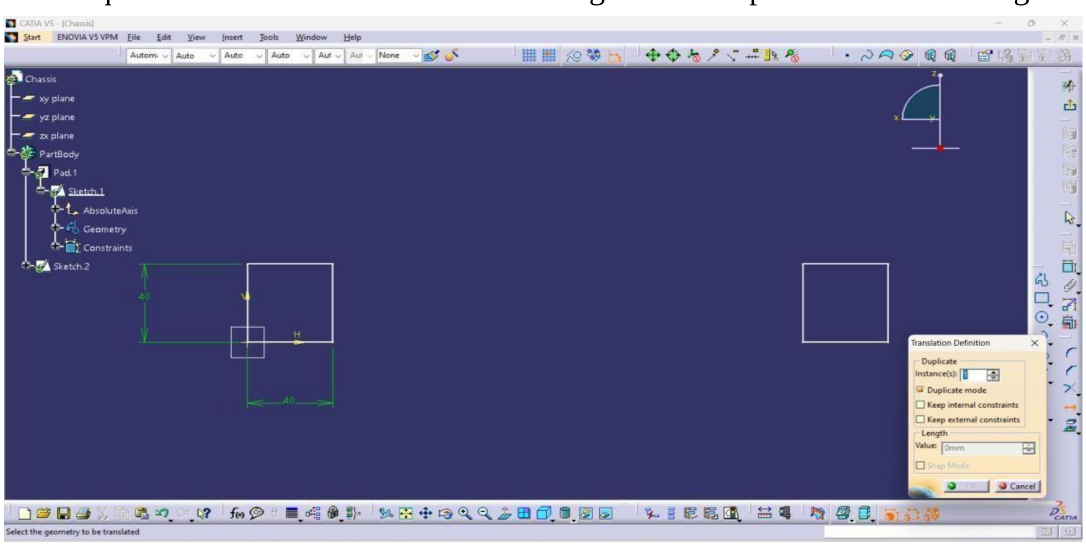

Fig 3.2 Translate Long runner square drawing

Both the squares are extruded to a length of 1200mm using pad option as shown in fig 3.3

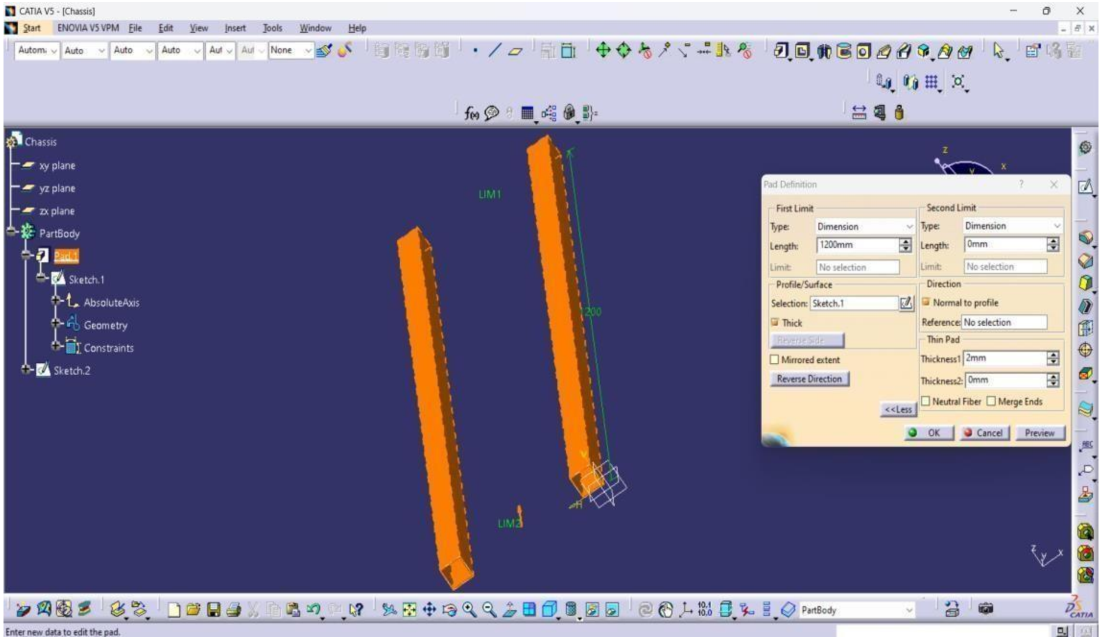

Fig 3.3 Extrusion of long runners using pad option

2 Squares of 40mm x 40mm are drawn on long runners to extrude vertical members as shown in fig 3.4

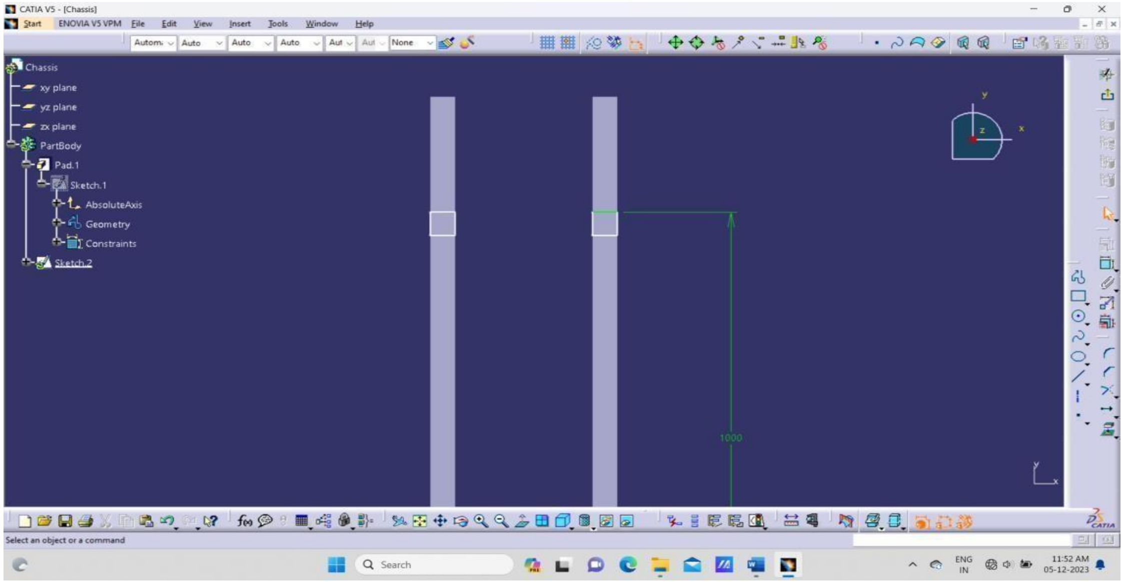

Fig 3.4 Squares on Long runners

Two Square pipes of 40mm x 40mm are extruded on long runners using pad option as shown in Fig3.5

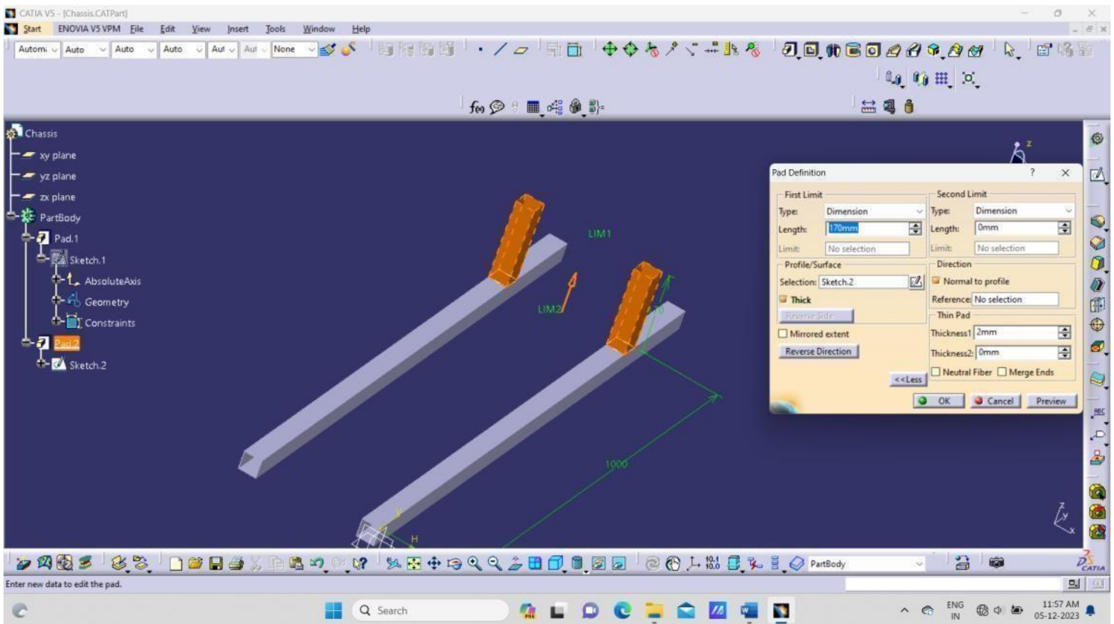

Fig 3.5 Extrusion of vertical members

Two squares of 40mm x 40mm are drawn on vertical members as shown in fig 3.6

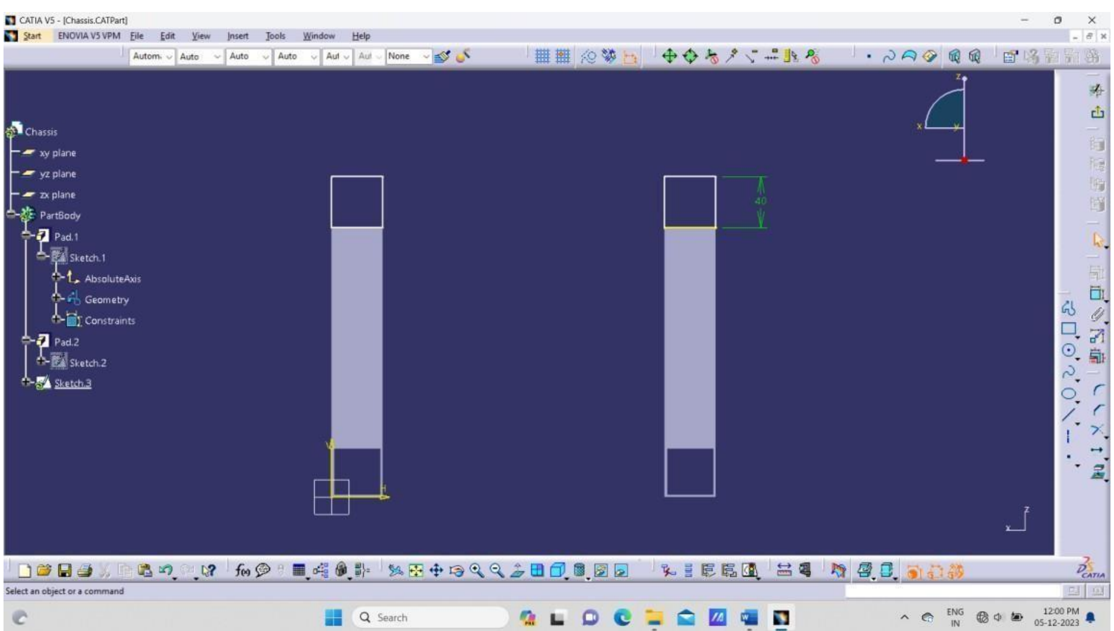

Fig 3.6 Seating level horizontal members drawing

Seating level horizontal members are extruded using pad option as shown in Fig 3.7

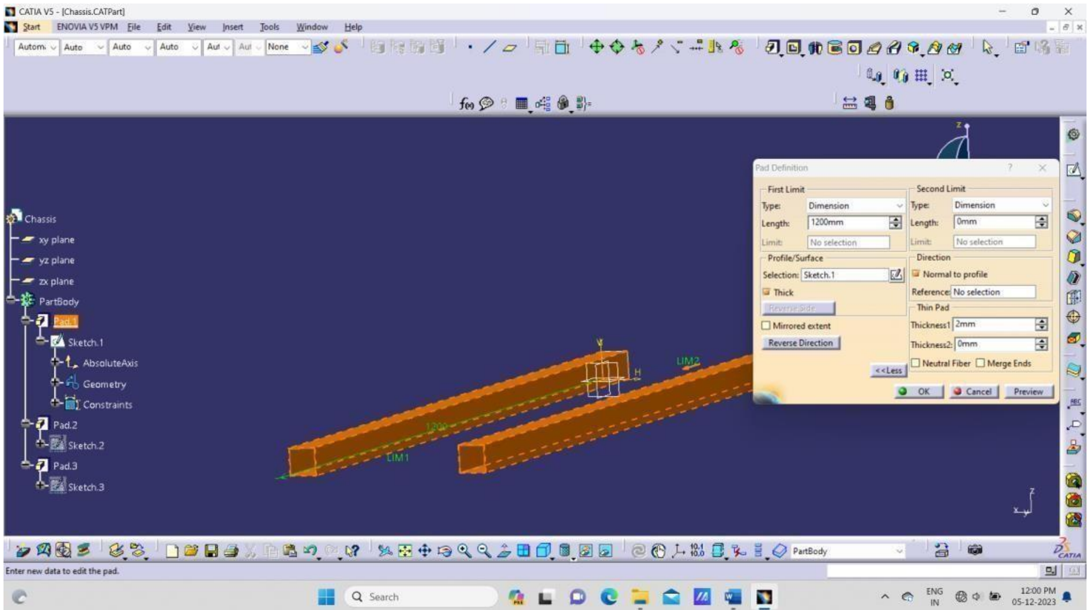

Fig 3.7 Extrusion of seating level horizontal members

Seating level horizontal members and long runners are joined by using rib option as shown in Fig 3.8

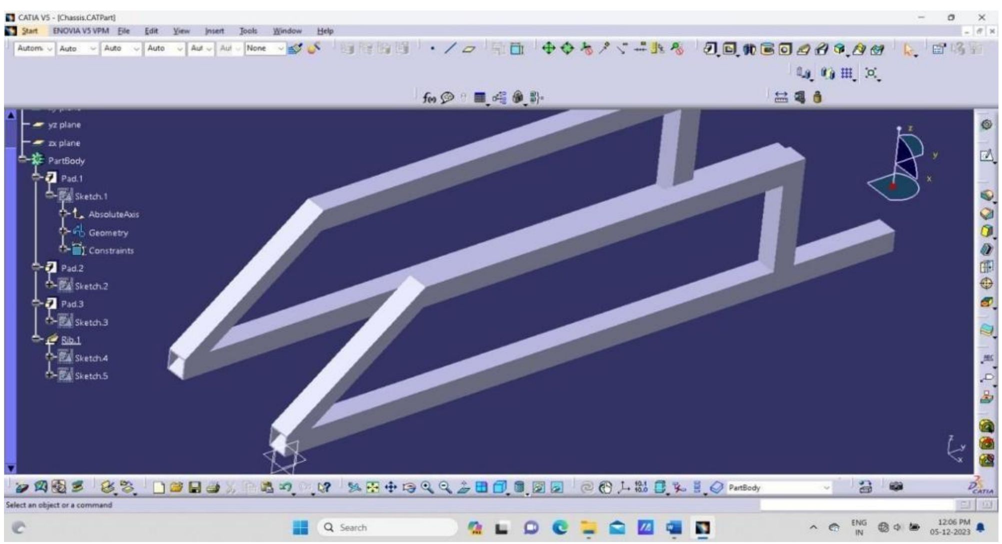

Fig 3.8 Extruding inclined members

Cross members are extruded from side frames of long runners using pad option as shown in Fig3.9

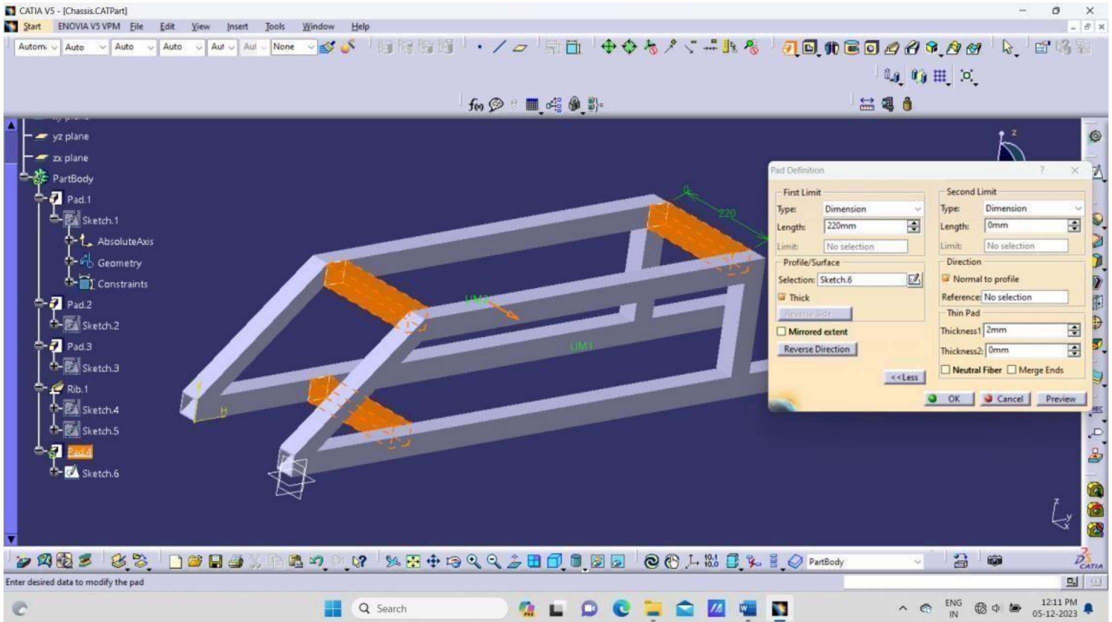

Fig 3.9 Extrusion of Cross Members

Front wheel bar of 25mm x 50mm is drawn below long runners as shown in Fig 3.10

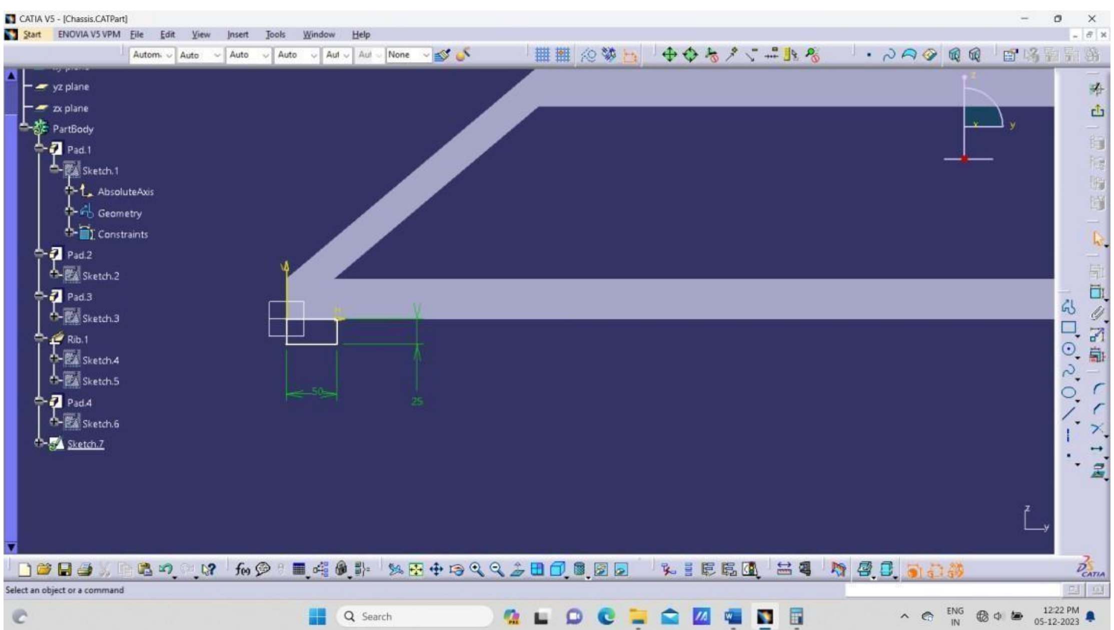

Fig 3.10 Front Wheel Bar Drawing

Front wheel bar is extruded using pad option as shown in fig 3.11

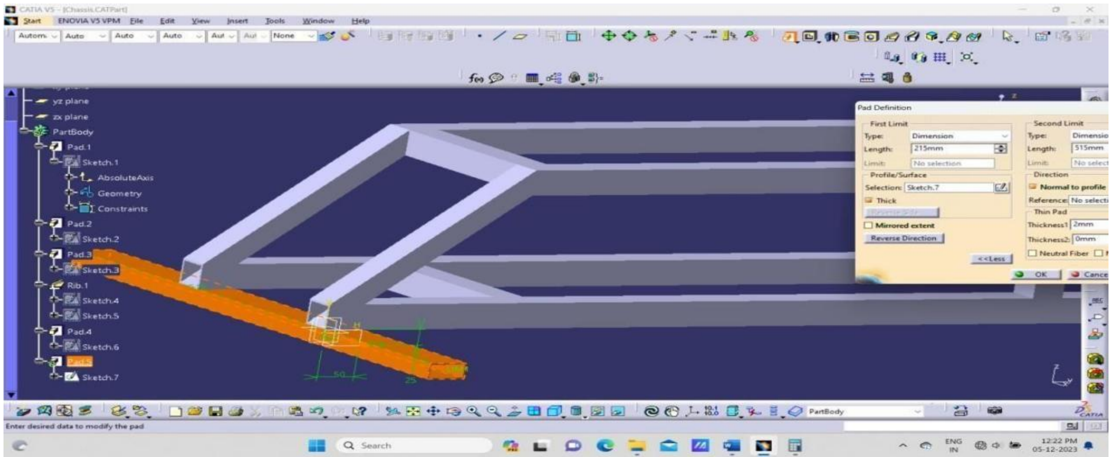

Fig 3.11 Extrusion of Front Wheel Bar

Stub axle brackets plates of 60mm x 120mm are drawn on front wheel bas as shown in fig 3.12

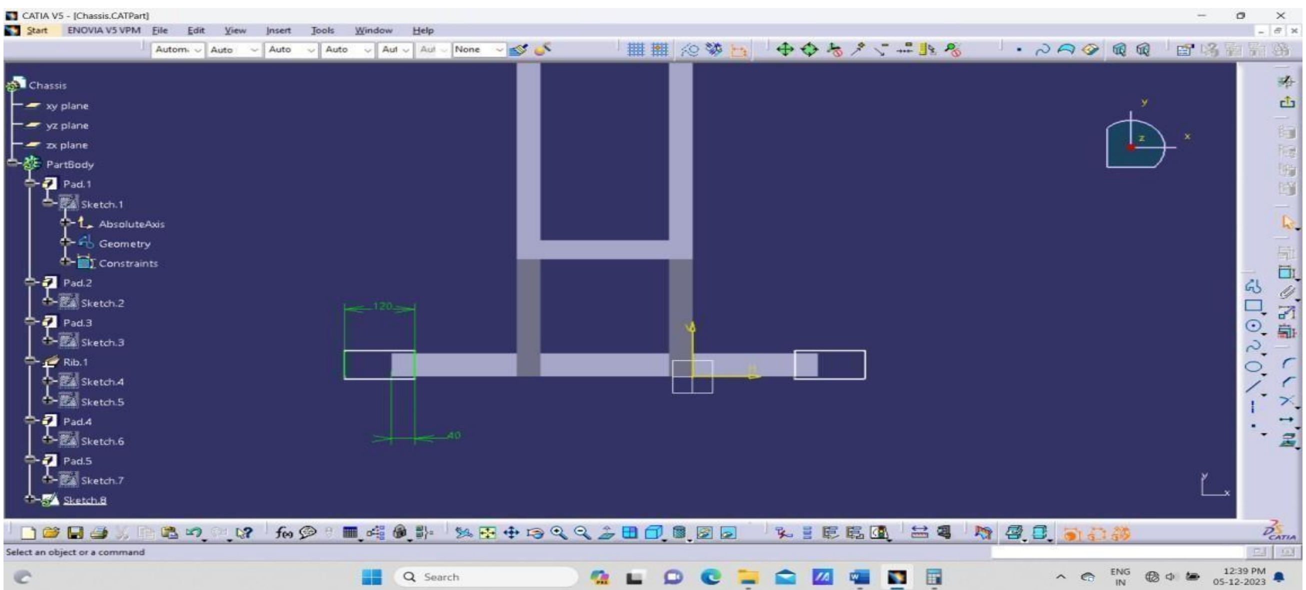

Fig 3.12 Stub axle brackets plates drawing

Stub axle bracket plates are extruded using pad option as shown in fig 3.13

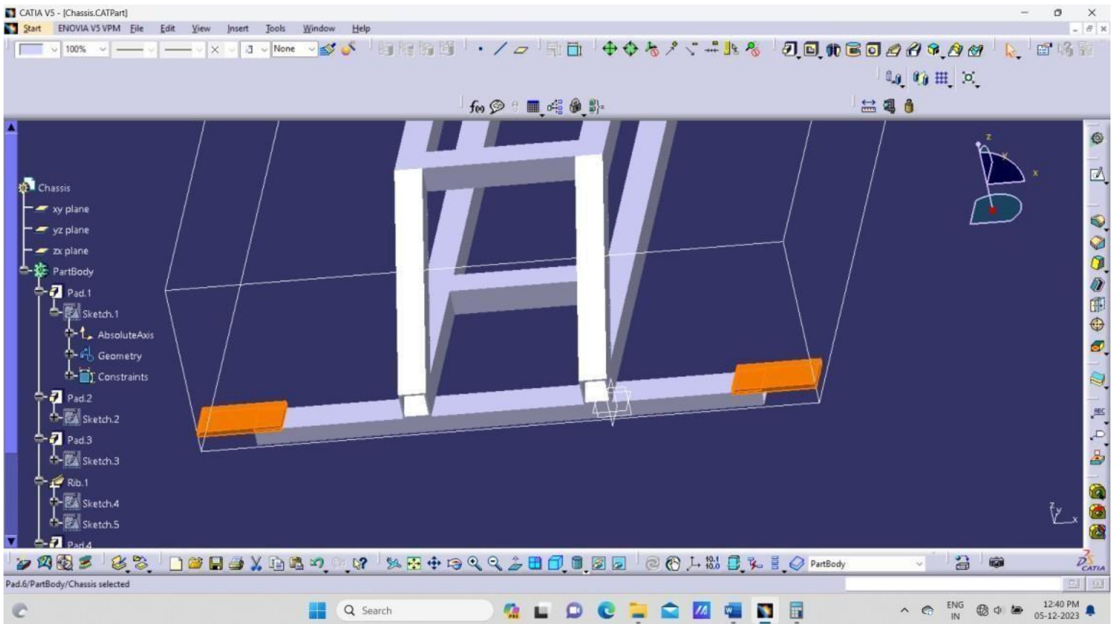

Fig 3.13 Stub axle bracket plate extrusion

Stub axle bracket vertical plates are extruded using pad option as shown in fig 3.14

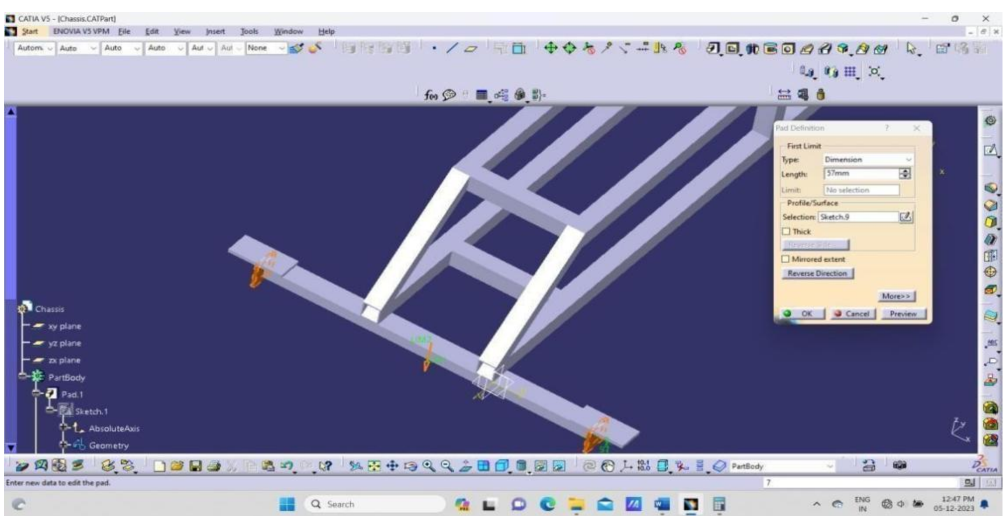

Fig 3.14 Stub axle bracket vertical plates extrusion

Stub axle bracket bottom plates are extruded using pad option as shown in fig 3.15

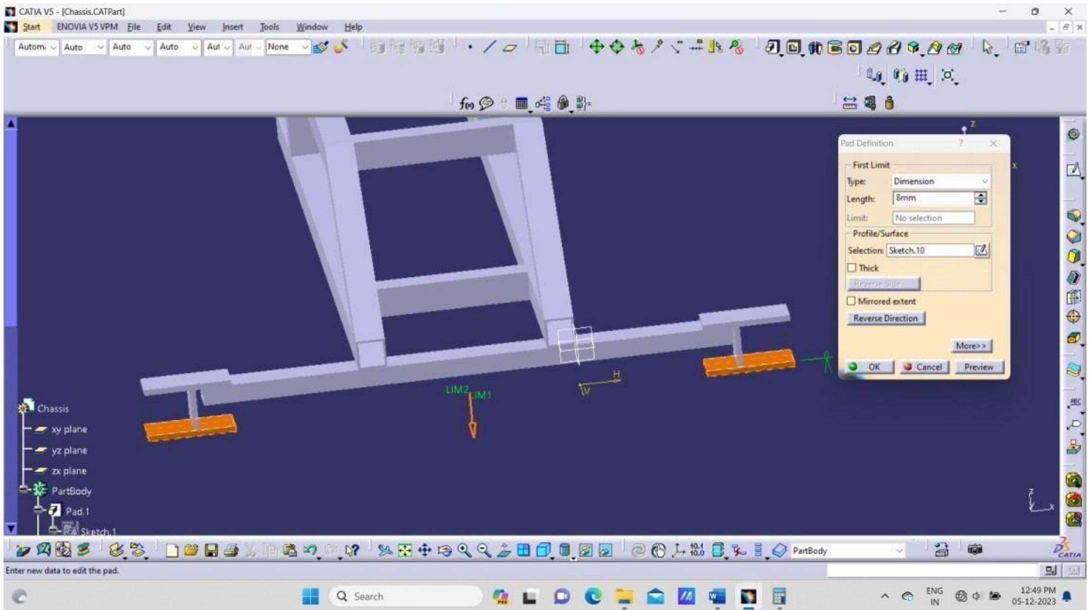

Fig 3.15 Stub axle bracket bottom plate extrusion

12mm through hole is made on front wheel right bracket plates as shown in Fig 3.16

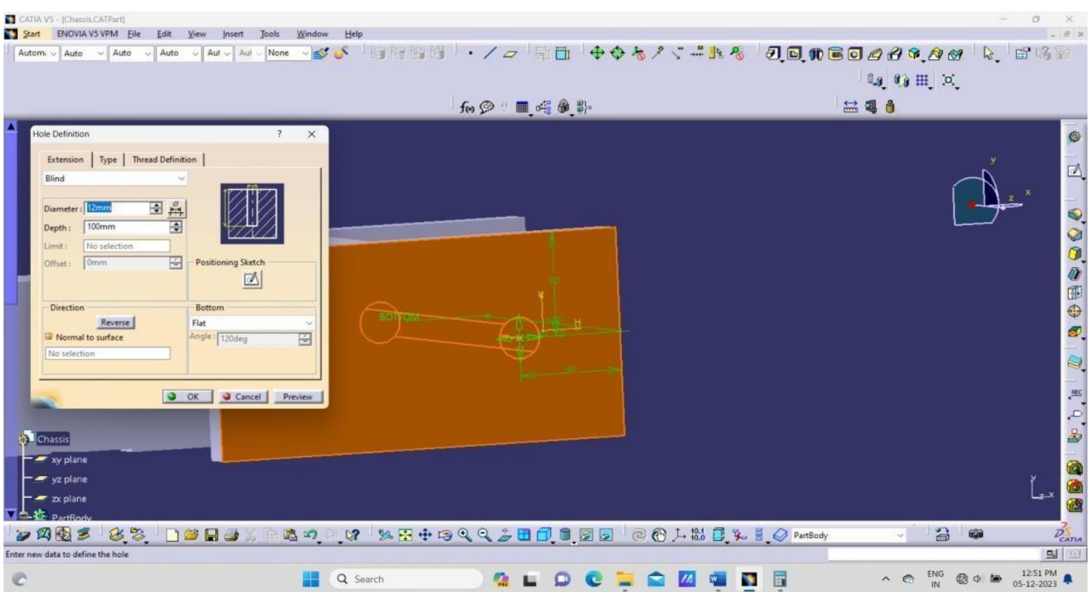

Fig 3.16 Hole on Front Axle Right Bracket Plates

12mm through hole is made on front wheel left bracket plates

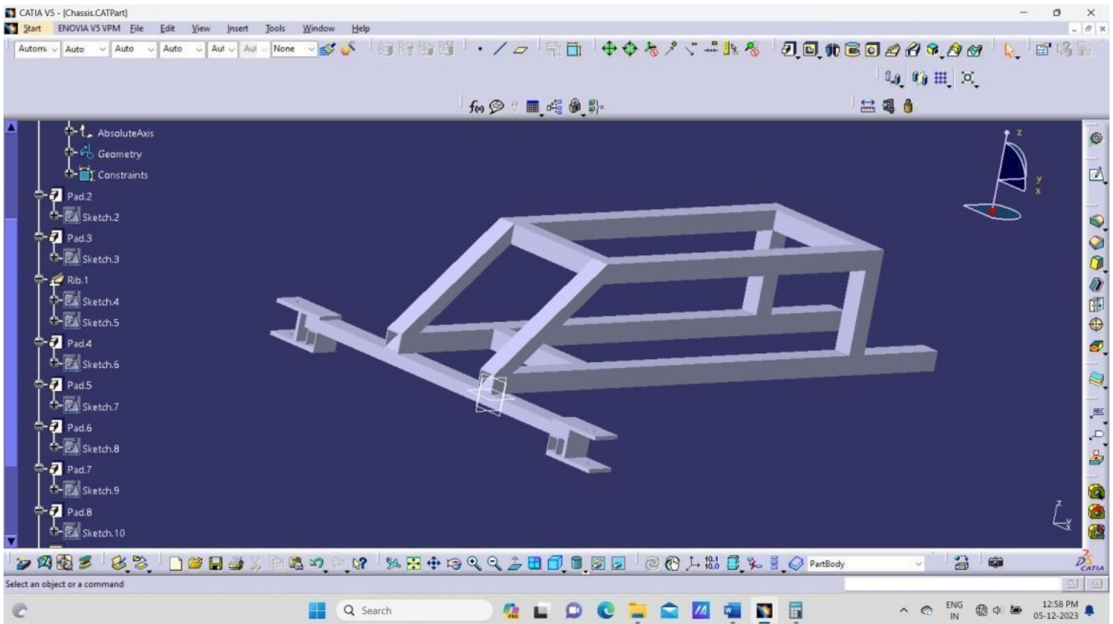

Fig 3.17 Hole on Front Axle Left Bracket Plates

A 300mm x 260mm driver seat is drawn and extruded on chassis as shown in Fig 3.18

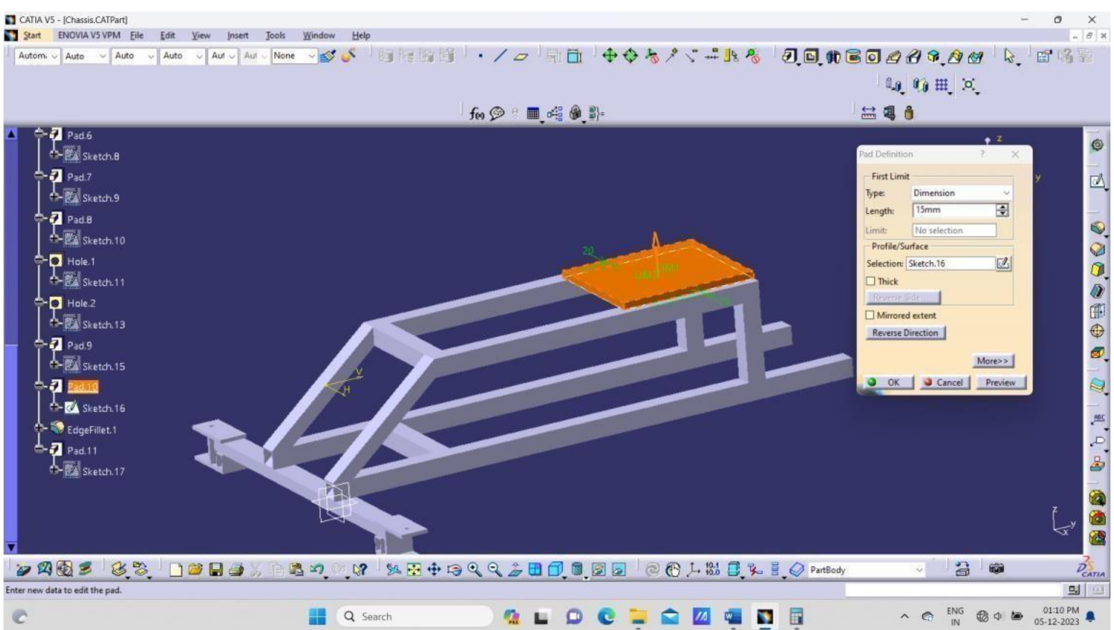

Fig 3.18 Driver seat extrusion

5mm radius fillet is one on all sides of driver seat as shown in fig 3.19

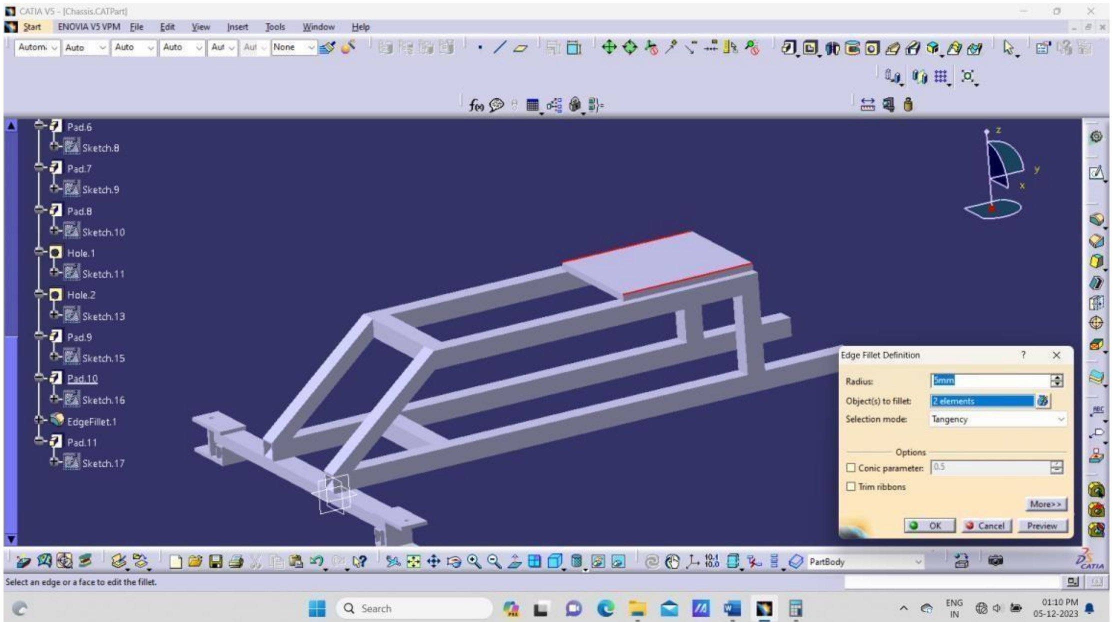

Fig 3.19 Fillet to the driver seat

Seat supports of 25mm square pipe are extruded below driver seat are extruded as shown in fig 3.2

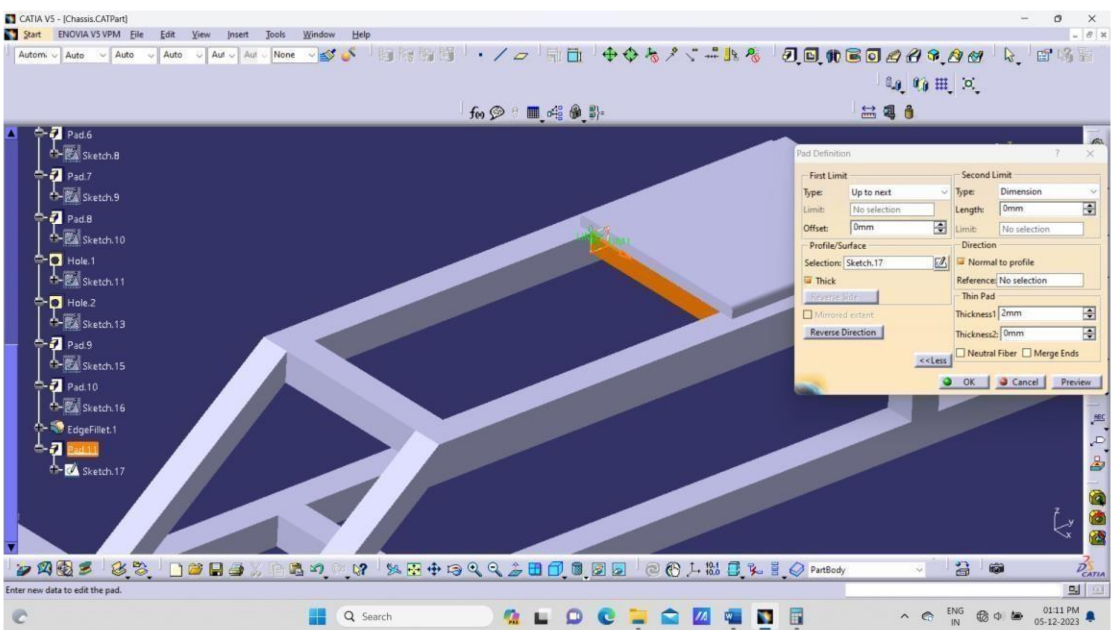

Fig 3.20 Seat Supports

Guides / Square pipes for retractable seat is drawn on chassis as shown in Fig 3.21

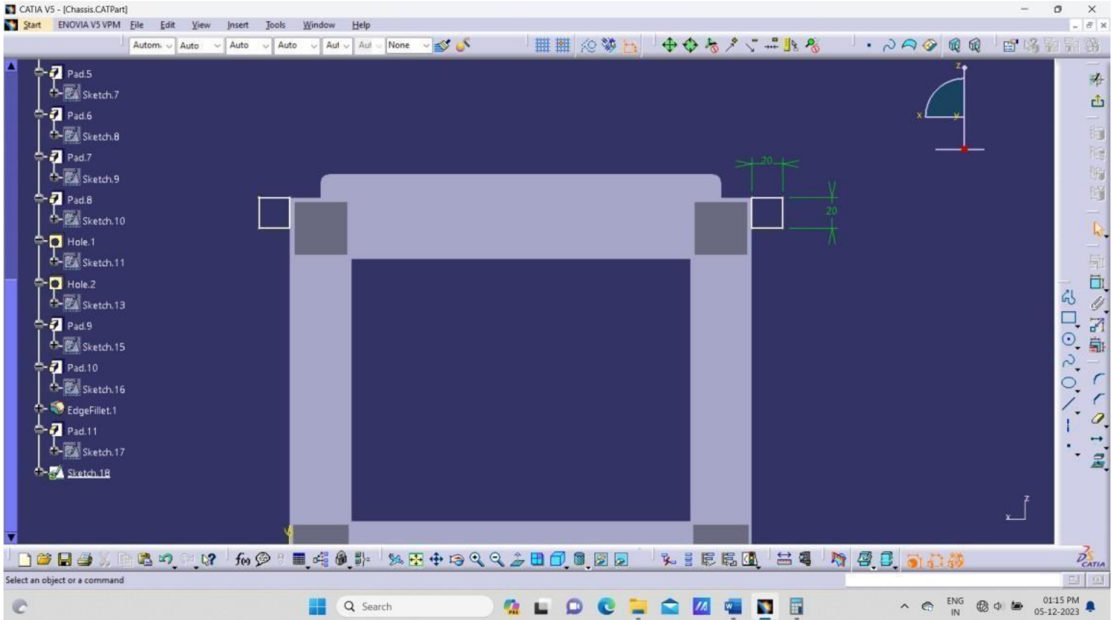

Fig 3.21 Guides / Square pipes for retractable seat

Guides / Square pipes for retractable seat are extruded using pad option as shown in Fig 3.22

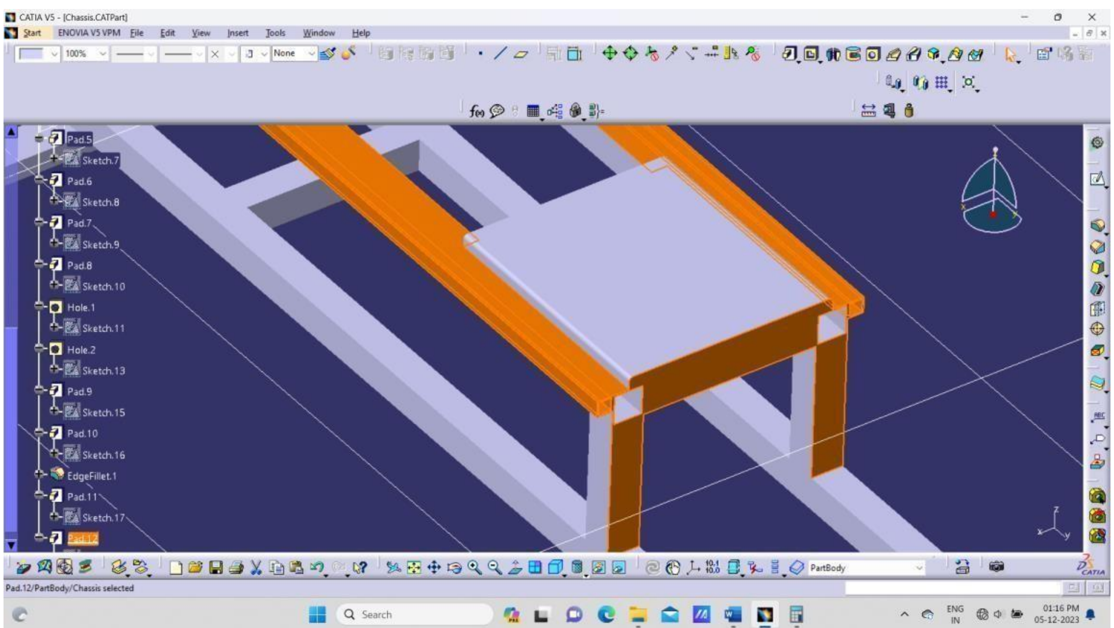

Fig 3.22 Extrusion of Guides

12mm hole is made at the bottom of the long runner to fix bearing as shown in fig 3.23

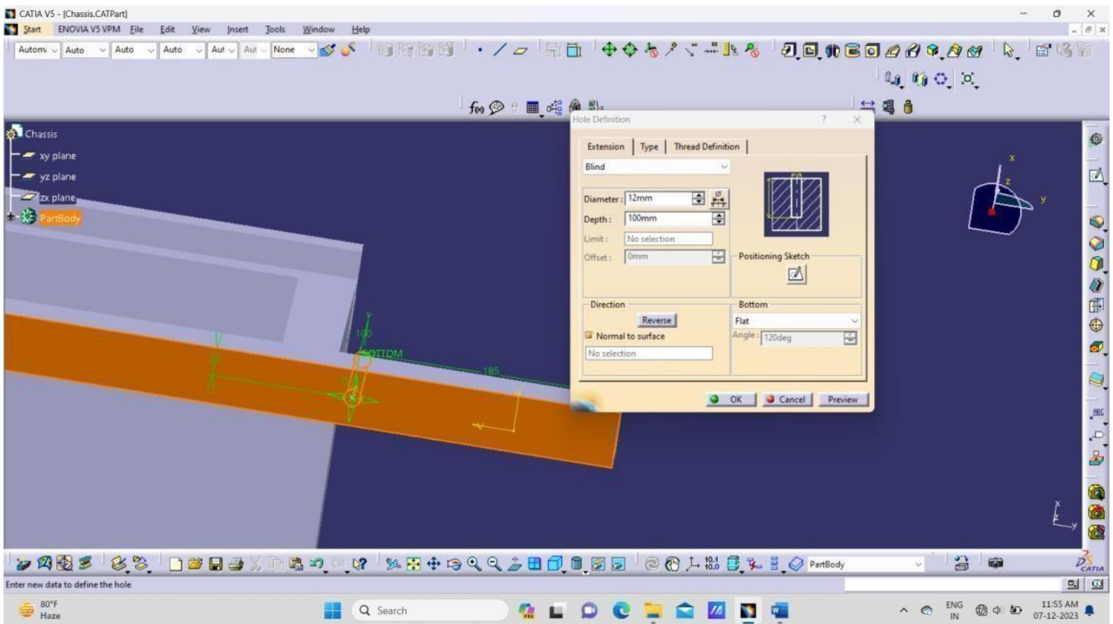

Fig 3.23 Hole for bearing

Another 3 holes of 12mm diameter are made on chassis for bearing using array option as shown in Fig 3.24

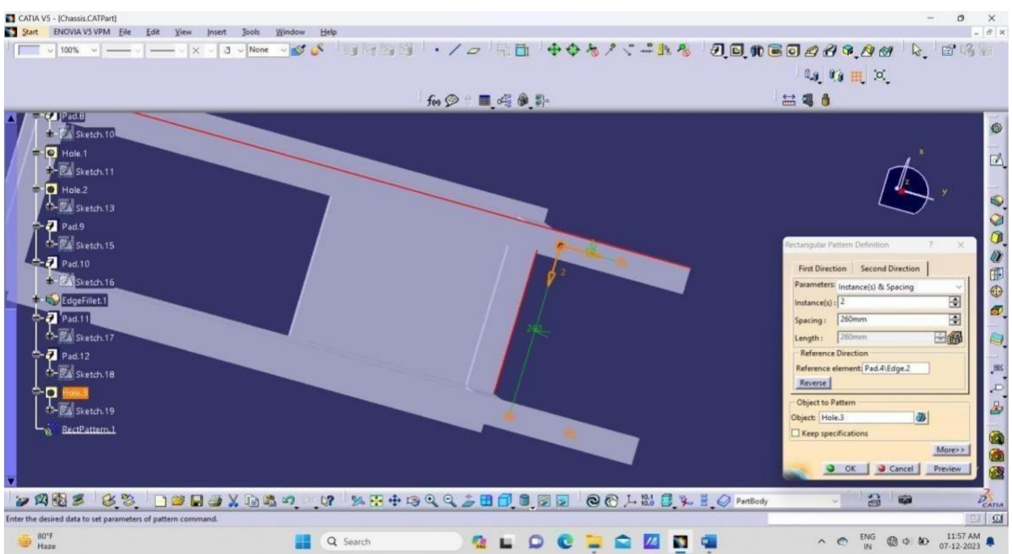

Fig 3.24 Hole array

ANALYSIS

Structural analysis is performed using Catia V5 software. The average mas of 150Kgs is considered for 2 persons and load is applied on the chassis based on which the maximum von-mises stress found is 2.37MPa as shown in Fig 3.25

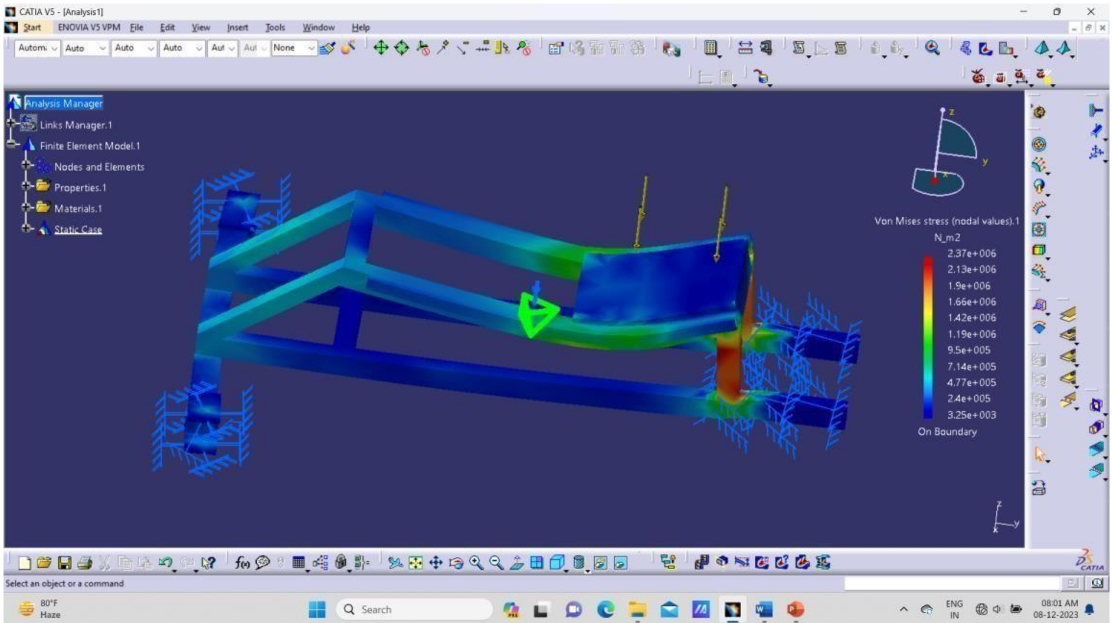

Fig 3.25 Stress Diagram

The maximum transitional displacement found upon application of load is 0.00537mm which is negligible

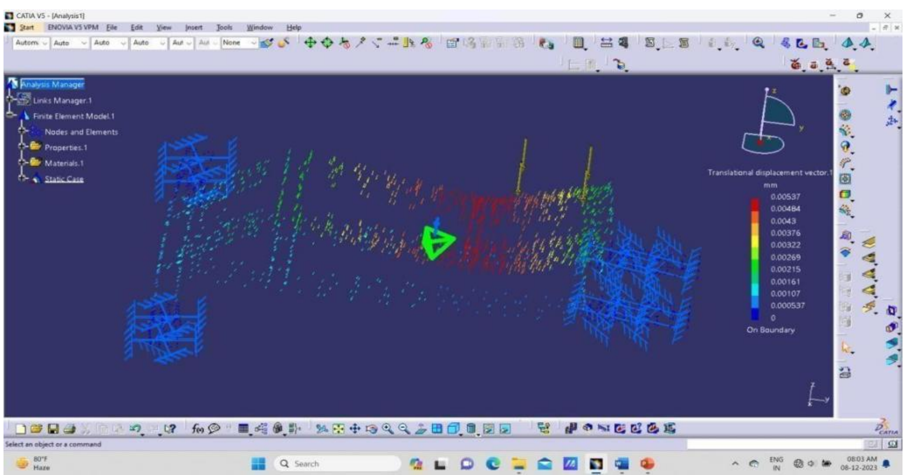

Fig 3.26 Transitional Displacemen

CHAPTER 4
FABRICATION

4.1 MATERIALS USED:

In this project we used MS (Mild steel) square pipes, steel metal, MS (Mild Steel) plates, drill screws, Wise, metal flat.

For marking and measuring we have been used different types of materials like

- Marker
- Steel rule
- Try square
- Whitener

For performing operations, we have been used different types of machines like

- Cutting Machine
- Grinding machine
- Welding machine
- Drilling machine

4.2 PARTS PREPARATION:

CHASSIS

We have taken a Mild Steel (MS) Square pipe of side 40mm and thickness 2mm as shown in figure (4.1.1).

Fig (4.2.1) Mild Steel Pipe

We have marked the pipe at distance 1200mm from its edge and using measuring and marking tools as shown in figure (4.2.2).

Fig (4.2.2) Marking on pipe

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.3).

Fig (4.2.3) Cutting of square pipe

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.4)

Fig (4.2.4) Grinding of square pipe

We have obtained 2 pipes of length 1200mm, side 40mm and thickness 2mm by following above mentioned process.

We have taken a Mild Steel (MS) Square pipe of side 40mm and thickness 2mm as shown in figure (4.2.5)

Fig (4.2.5) Mild Steel Pipe

We have marked the pipe at distance 1080mm from its edge using measuring and marking tools as shown in figure (4.2.6).

Fig (4.2.6) Marking on pipe

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.7).

Fig (4.2.7) Cutting of square pipe

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.8).

Fig (4.2.8) Grinding of square pipe

We have obtained 2 pipes of length 1080mm, side 40mm and thickness 2mm by following above mentioned process.

As our Chassis frame is inclined in the front up to 40degrees, we have marked the obtained length1080mm pipe at distance 900mm from its edge with an angle of 40degrees using measuring and marking tools as shown in figure (4.2.9).

Fig (4.2.9) Marking on pipe

We have performed cutting operation for obtained length 1080mm pipe using angle grinder machine with respect to the markings as shown in figure (4.2.10).

figure (4.2.10) Cutting of square pipe

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.11).

Fig (4.2.11) Grinding of square pipe

Now, after grinding operation according to the design we have performed bending operation by fitting the pipe in wise as shown in the figure (4.2.12).

Fig (4.2.12) Bending operation

We have obtained 2 pipes of length 1080mm, width 40mm and thickness 2mm and with an angle 40degrees by following above mentioned process.

We have taken a Mild Steel (MS) pipe of length 25mm, breadth 50mm and thickness 2mm as shown in figure (4.2.13).

Fig (4.2.13) Mild Steel Pipe

We have marked the pipe at distance 515mm from its edge using measuring and marking tools as shown in figure (4.2.14)

Fig (4.2.14) Marking on pipe

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.15).

Fig (4.2.15) Cutting of square pipe

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.16).

Fig (4.2.16) Cutting of square pipe

We have obtained one piece of pipe of length 515mm, length 25mm, breadth 50mm and thickness 2mm by following above mentioned procedure.

We have taken a Mild Steel (MS) plate of thickness 8mm as shown in the figure (4.2.17).

Fig (4.2.17) Mild Steel Plate

We have marked the plate at length 60mm and breadth120mm from its edge using measuring and marking tools as shown in figure (4.2.18).

Fig (4.2.18) Marking on plate

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.19).

Fig (4.2.19) Cutting of plate

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.20).

Fig (4.2.20) Grinding of plate

By following above mentioned procedure, we have obtained three more plates of length 60mm, breadth 120mm and thickness 8mm.

We have obtained 4plates of length 60mm, breadth 120mm and thickness 8mm by following above mentioned process as shown in the figure (4.2.21).

Fig (4.2.21) MS Plates

We have taken a Mild Steel (MS) plate of thickness 8mm as shown in the figure (4.2.22).

Fig (4.2.22) Mild Steel Plate

We have marked the plate at length 60mm and breadth 50mm from its edge using measuring and marking tools as shown in figure (4.2.23).

Fig (4.2.23) Marking on plate

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.24).

Fig (4.2.24) Cutting of plate

We have performed filing operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.2.25).

Fig (4.2.25) Filing of plate

By following above mentioned procedure, we have obtained one more plate of length 60mm, breadth 50mm and thickness 8mm as shown in the figure (4.2.26).

Fig (4.2.26) MS plates

We have obtained two plates of length 60mm, breadth 120mm and thickness 8mm by following above mentioned process.

We have taken a Mild Steel (MS) Square pipe of length 40mm and thickness 2mm as shown in figure (4.2.27).

Fig (4.2.27) Mild Steel Pipe

We have marked the pipe at distance 220mm from its edge using measuring and marking tools as shown in figure (4.1.28).

Fig (4.2.28) Marking on pipe

We have performed cutting operation using angle grinder machine with respect to the markings as shown in figure (4.2.29).

Fig (4.2.29) Cutting of square pipe

We have performed grinding operation after cutting operation using angle grinder machine to get better surface finish with respect to the markings as shown in the figure (4.1.30).

Fig (4.2.30) Grinding of square pipe

By following above mentioned procedure, we have obtained three more pipes of length 220mm, and thickness 2mm as shown in the figure (4.2.31).

Fig (4.2.31) MS square pipes

We have obtained four pipes of length 220mm and thickness 2mm by following above mentioned process. We have drilled plates with the help of radial arm drilling machine with an 8mm drill bit, at required location as shown in figure (4.2.32).

Fig (4.2.32) Drilling of plates

We have obtained all the structural plates by following above mentioned process as shown in figure (4.2.33).

Fig (4.2.33) Structural plates

We have welded all the pipes together using arc welding machine as shown in figure (4.2.34).

Fig (4.2.34) Welding of chassis base

We have obtained the chassis base frame by following above mentioned process as shown in figure (4.2.35).

Fig (4.2.35) Chassis base

We have welded the chassis base with horizontal support pipe (i.e. Long Runner) as shown in figure (4.2.35).

Fig (4.2.35) Welding of long runner

We have welded all the pipes into the chassis base using arc welding machine as shown in figure (4.2.36).

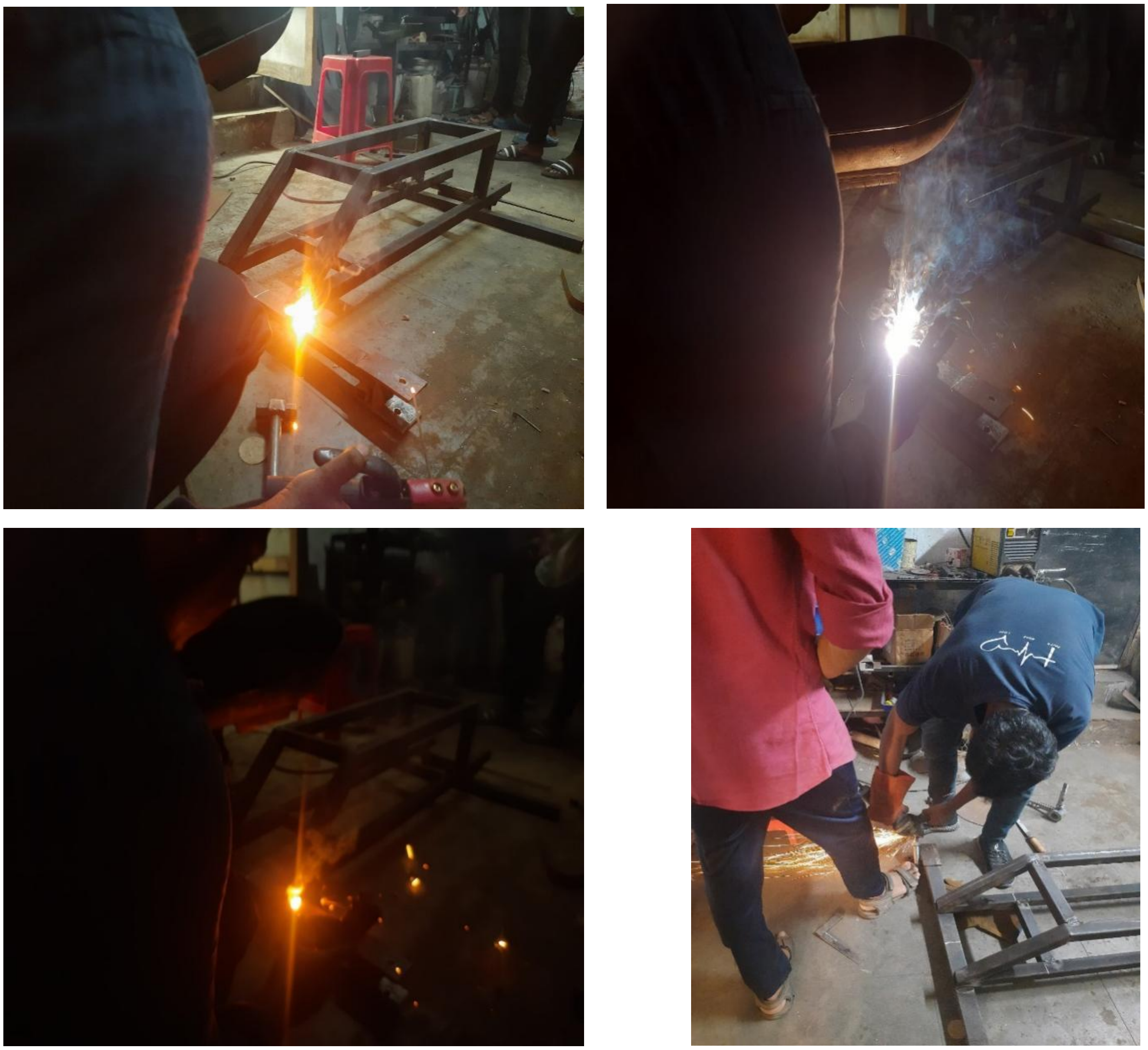

Fig (4.2.36) Chassis

4.3 PAINTING

The chassis frame is painted to avoid the formation of rust on the mild steel pipes of the frame as shown in the figure (4.3.1).

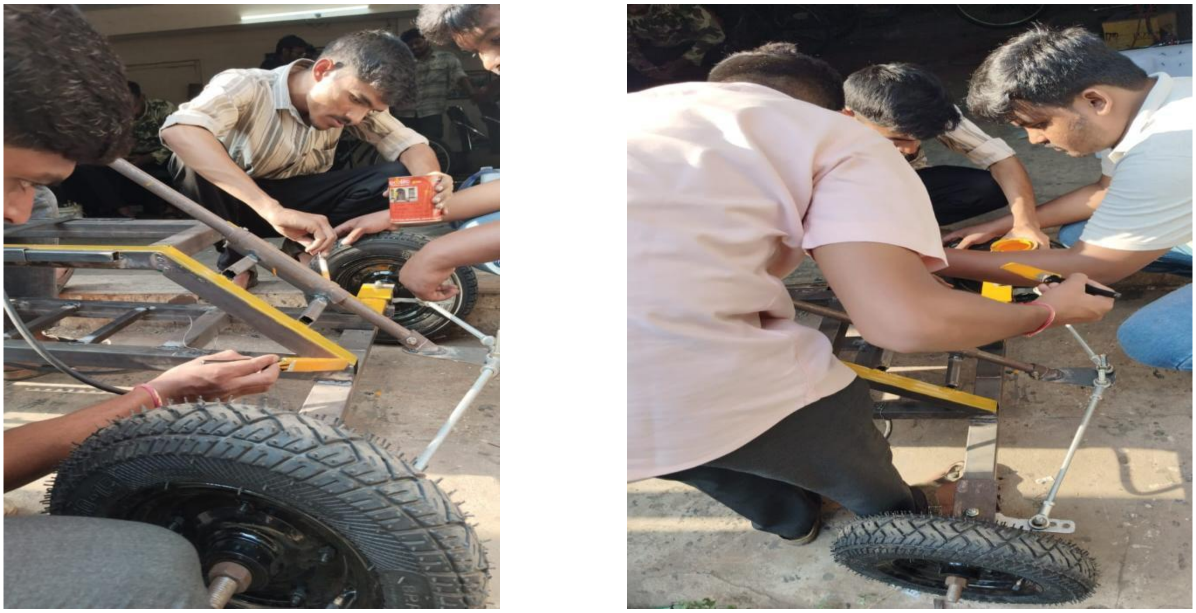

Fig (4.3.1) Painting of chassis

To get better finish chassis is painted for 3 coats with oil paint image of the which is shown in figure (4.3.2).

Fig (4.3.2) Painting of chassis

4.4 PARTS ASSEMBLY

We have assembled all the components together and the final image of the project is as shown in figure (4.4.1).

Fig (4.4.1) Project image after assembly

We have fixed the motor in between the chassis as shown in the figure (4.4.2)

Fig (4.4.1) Assembling of motor

We have fixed the controller in front of motor in the chassis as shown in the figure (4.4.3)

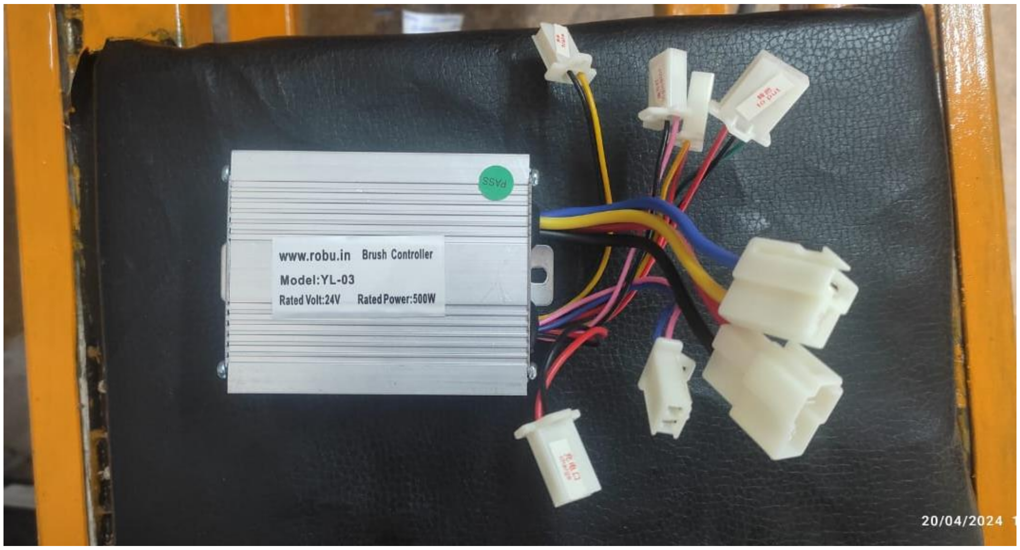

Fig (4.4.3) Controller

We have fixed the batteries in front of controller in the chassis as shown in the figure (4.4.4)

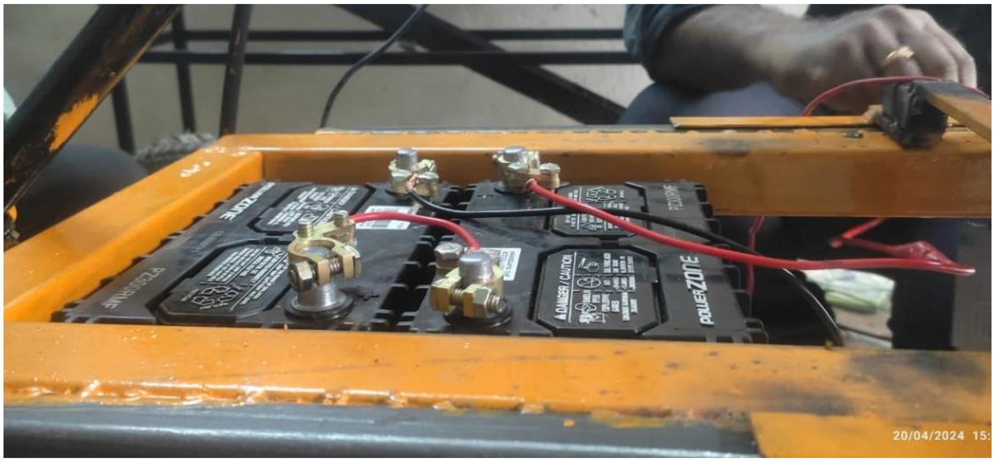

Fig (4.4.4) Batteries

Wiring is performed using 2-way switches as shown in Fig (4.4.5)

Fig (4.4.5) Wiring

The overall assembling of Go-kart has been completed and the vehicle is ready to drive as shown in the figure (4.4.6)

Fig (4.4.6) Go-kart Vehicle

MATERIAL COMPOSITION

PROPERTIES	Gr. 43A (Pipe)
% carbon	0.25 to 0.3
Density (g/cc)	7653 Kg/Cum
Yield Strength MPa	240
Elastic Modulus GPa	200 to 215
Tensile Strength MPa	430 to 510

Table 4.2.1 Material Specifications

PARAMETERS	SPECIFICATION
Overall length	1450mm
Overall width	960mm
Overall height	500mm
Wheel base	1160mm
Track width	860mm
Ground clearance	200mm
Max speed	50Kmph
C.G. height	149mm
Stopping distance	24m
Overall weight	74Kg
Streering ratio	1
Motor	Geared Motor
Battery	Lead Acid
Tuning radius	3.4m
Disc brake	12”

Table 4.2.1 Vehicle Specifications

CHAPTER-5
RESULTS AND ISCUSSIONS

3 Wheel electric (battery powered) Go Kart is one of the less weight designs that consumes less energy and adds no pollution to the environment. As a part of our project dissertation, wefabricated chassis for telescopic 3-wheel go-kart which contains,

- Less in mass hence gives good energy economy
- No pollution
- Easy to transport as it occupies less space

- Electric go-karts are likely to have a significant impact on traditional gas-powered ones in several ways. Firstly, electric go-karts are more environmentally friendly since they produce zero emissions, which aligns with the global trend towards sustainability and clean energy. This environmental advantage may lead to stricter regulations and incentives favoring electric vehicles, potentially phasing out gas-powered go-karts in certain areas.
- Moreover, electric go-karts are generally quieter than their gas counterparts, providing a more pleasant and peaceful racing experience. This reduced noise pollution can make electric go-karts more appealing for indoor tracks or areas sensitive to noise disturbances.
- Additionally, electric go-karts often have lower maintenance costs and simpler mechanical systems compared to gas-powered ones, leading to potential cost savings for owners and operators in the long run. The ease of charging electric go-karts compared to refueling gas-powered ones can also contribute to increased convenience and operational efficiency.
- While traditional gas-powered go-karts may still have a place in certain settings or for specific purposes, the growing popularity and advancements in electric go-karts suggest that they could gradually become the preferred choice in the future, ultimately impacting the market and usage of gas-powered go-karts.

PARAMETERS	**SPECIFICATION**
Overall length	1450mm
Overall width	960mm
Overall height	500mm
Wheel base	1160mm
Track width	860mm
Ground clearance	200mm
Max speed	50Kmph
C.G. height	149mm
Stopping distance	24m
Overall weight	74Kg
Streering ratio	1
Motor	Geared Motor
Battery	Lead Acid
Tuning radius	3.4m
Disc brake	12”

Table 5.1 Vehicle Specifications

CHAPTER-6

CONCLUSION

We are using 40mm x 40mm, 25mm x 50mm and 25mm x 25mm Mild steel pipes to fabricate chassis of go-kart. The mild steel material sizes and thickness of 2mm is sufficient to bear the load of 150Kgs as per the analysis conducted. The chassis is so designed, it is able to accommodate motor, 3 wheels, batteries, driver and retractable seat, controller etc., After assembly the telescoping 3-wheel go-kart appears as below;

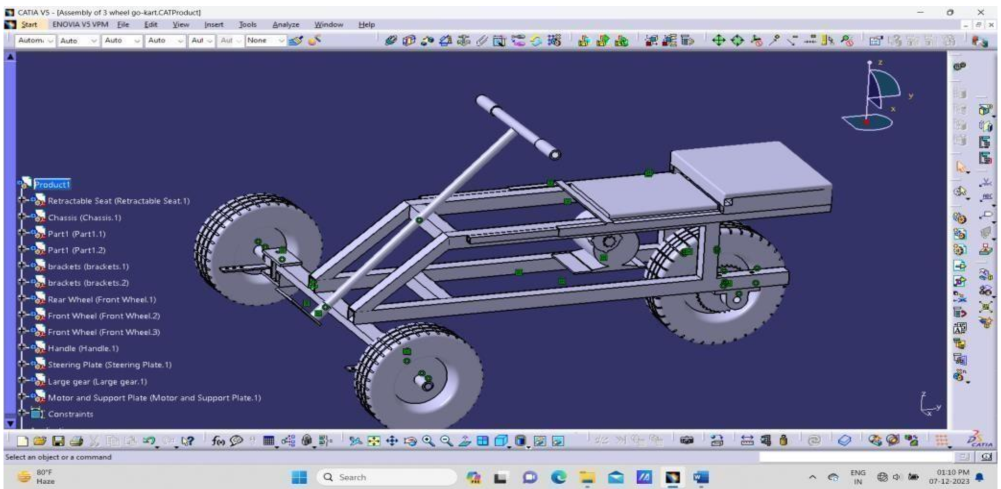

Fig 6.1 Overall Design

Fig 6.2 Final Design

CHAPTER 7

FUTURE SCOPE

- The future scope of 3-wheel electric go-karts looks promising due to the increasing demand for eco-friendly transportation options. Electric go-karts are environmentally friendly as they produce zero emissions, making them a popular choice for individuals and businesses looking to reduce their carbon footprint.
- In terms of technology, advancements in battery technology are continuously improving the performance and range of electric vehicles, including go-karts. This means that future 3-wheel electric go-karts could have longer ranges, faster speeds, and shorter charging times, making them more convenient and efficient.
- Additionally, the growing interest in electric vehicles as a whole, along with government initiatives promoting clean energy transportation, could lead to increased adoption of 3-wheel electric go-karts for recreational activities, racing events, and even urban transportation solutions.
- Overall, the future of 3-wheel electric go-karts seems bright, with potential for further innovation, improved performance, and a significant role in the shift towards sustainable mobility.

REFERENCES

- Company, Houghton Mifflin Harcourt Publishing. "The American Heritage Dictionary entry: chassis"
- Sturmey, Henry (2 April 1908). "The Use of Unsuitable Vehicles". Commercial Motor. 7 (160): 146–147. Retrieved 10 September 2010.
- Pfeffer, Prof Dr Peter E. (2017). 8th International Munich Chassis Symposium 2017: chassis.tech plus. Springer. p. 176. ISBN 9783658184599.
- Jump up to:[a] [b] "Tatra takes you further". Retrieved 1 July 2015.
- "Tatra AS". Archived from the original on 28 March 2010. Retrieved 22 August 2013.
- "Triumph Herald 2000 chassis". Triumph Herald 2000 and Viking Fibreline Caravan. Paul.
- "Build your own TATRA - Segment selection". Retrieved 1 July 2015.
- "An all-time longest and heaviest TATRA has been produced!". Tatra. 21 August 2015.
- Grenzeback, Lance R.; Lin, Sandi; Meunier, Jacob (2005). Operational Differences and Similarities among the Motorcoach, School Bus, and Trucking Industries. Transportation Research Board. p. 13. ISBN 978-0-309-08821-3. Retrieved 10 September 2010.