



SAEINDIA The Engineering Society
For Advancing Mobility
Land Sea Air and Space

INTRODUCTION TO AUTOMOBILE

presented by :-
3rd sem.



- *CHASSIS*
- *SUSPENSION*
- *BRAKE*
- *ANTI BRAKE*
- *TRANSMISSION*
- *IC ENGINE*



CHASSIS

the Skelton

- Chassis is a French term which denotes the whole vehicle except body in case of heavy vehicles.
- In case of light vehicles of mono construction it denotes the whole body except additional fitting in the body.
- Chassis consists of engine,brakes,steering system & wheel mounted on the frame,differential,suspension.

- *Chassis in electronic device consists of the metal frame on which the circuit boards & other electronics are mounted.*
- *In absence of a metal frame the chassis refers to the circuit boards & component themselves, not the physical structure.*
- *In computer chassis refers to the rigid framework on which motherboard, memory, disk drives & other equipments are mounted.*

ITS PRINCIPAL FUNCTION:

- *To safely carry the maximum load.*
- *Holding all components together while driving.*
- *Accommodate twisting on even road surface.*
- *Endure shock loading.*
- *It must absorb engine & driveline torque.*

CLASSIFICATION OF CHASSIS

According to control:

- *conventional-forward chassis*
- *Semi-forward chassis*
- *Full-forward chassis*

Conventional chassis:

- *Engine is fitted in front of the driver cabin or driver seat such as in cars.*
- *Chassi portion can not be utilized for carrying passengers and goods*



Semi-forward chasis

- *Half portion of the engine is in the driver cabin & and remaining half is outside the cabin such as in tata trucks*
- *In this arrangement a part of the chassis is utilized for carrying extra passengers*



HOSTED ON :
Team-BHP.com
Copyrights Respective Owners

Full-forward chassis

- *Complete engine is mounted inside the driver cabin*
- *Driver seat is just above the front wheel*



ACCORDING TO FITTING TO ENGINE :

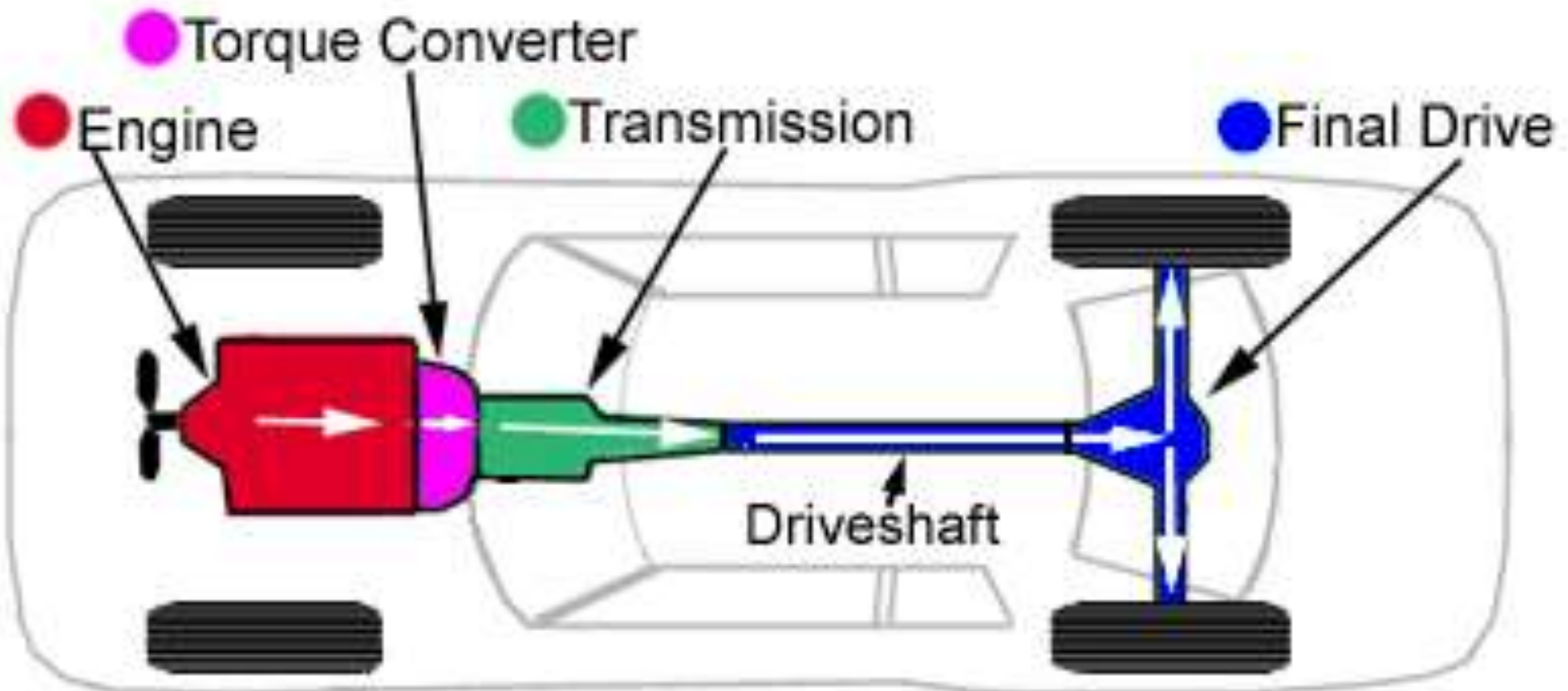
- *Engine at front*
- *Engine fitted in front but crosswise*
- *Engine fitted at the centre of the chassis*
- *Engine fitted at the back*

ENGINE AT FRONT:

- *Conventionally the engines are fitted at front & drive is given to the wheels from the “rear”*

Advantage :

- *Enough space is available for luggage behind the rear seat*
- *The weight of vehicles is well balance*
- *Increased efficiency of cooling system*



Rear Wheel Drive Layout



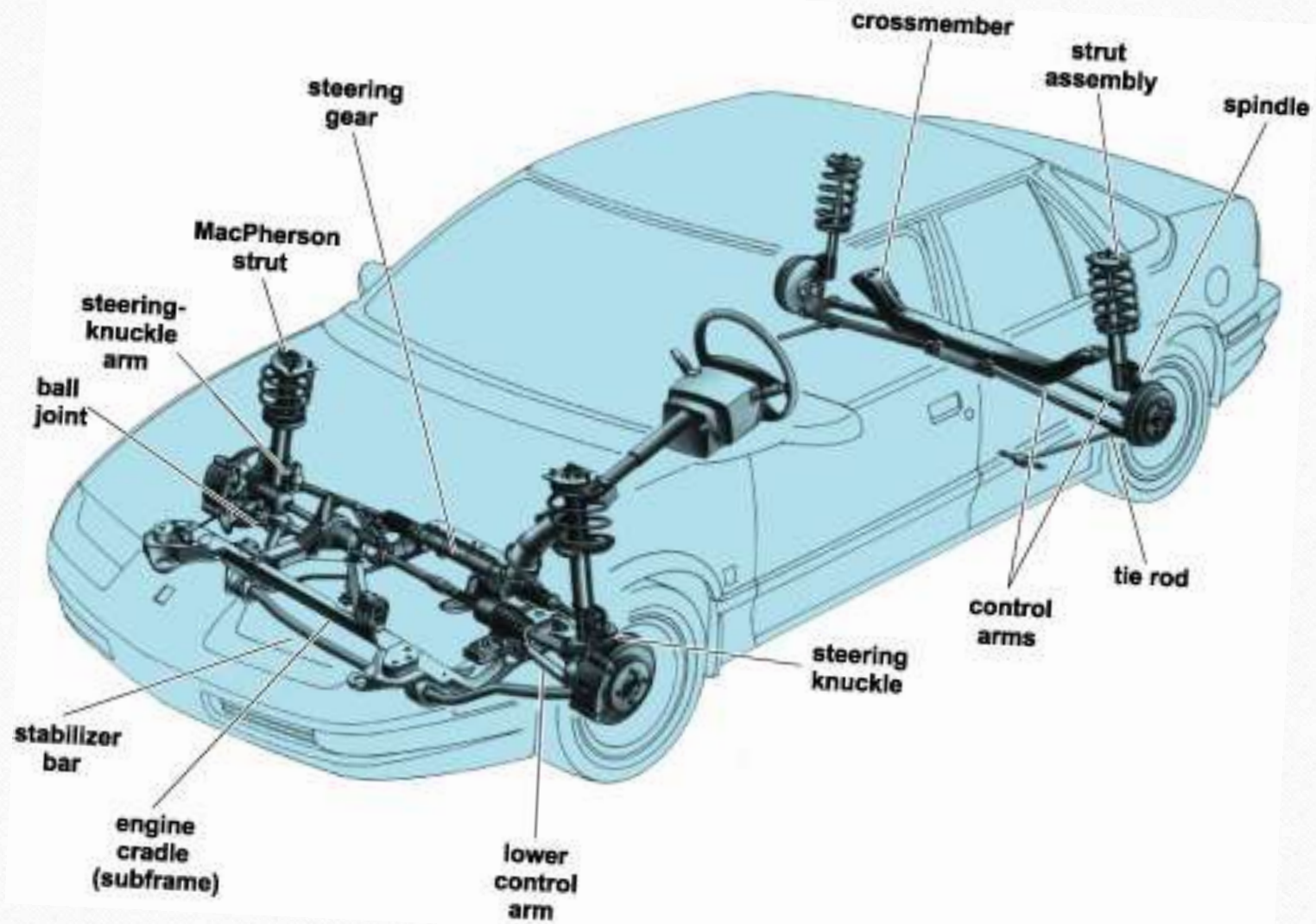
- ***Engine is fitted at front & drive is given to front wheel***

Advantage:

- *Low floor is available.*
- *Vehicle has more road holding capacity.*
- *clutch , gear box & differential are usually made as one unit, thereby cost is reduced.*

Disadvantage:

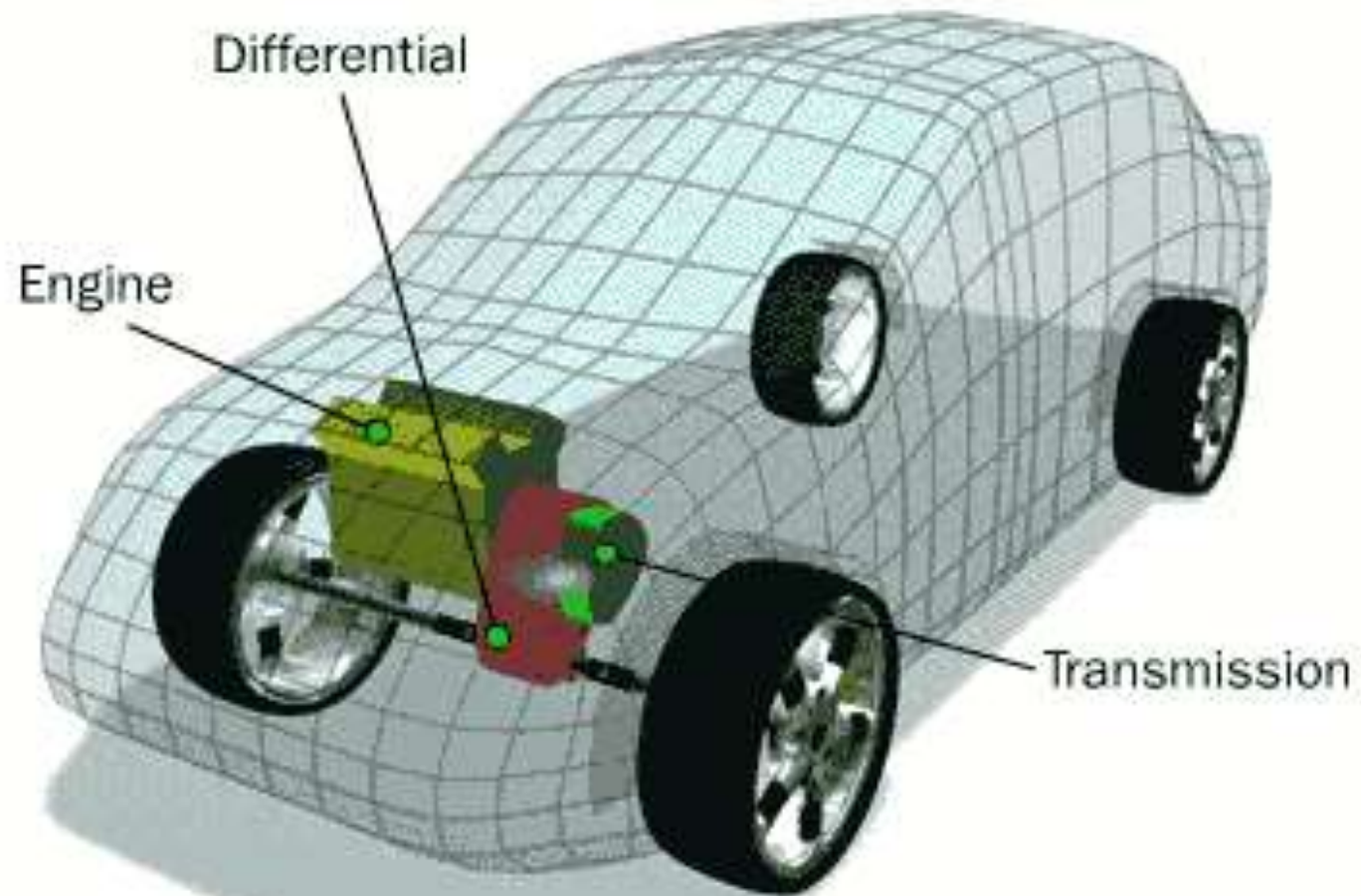
- *Weight of the vehicle shift to the rear wheels which is not desirable for better adhesion/attachment.*



Engine is fitted in front but crosswise:

- *Drive is given to front wheel*
- *As in Maruti & B.M.C*

Front-Wheel Drive



Engine fitted at the centre of the chassis:

- *Drive is given to the rear*
- *As in royal tiger world master buses previously piled by*
- *This arrangement provide full space of floor for use*

Engine fitted at the centre of the chassis:

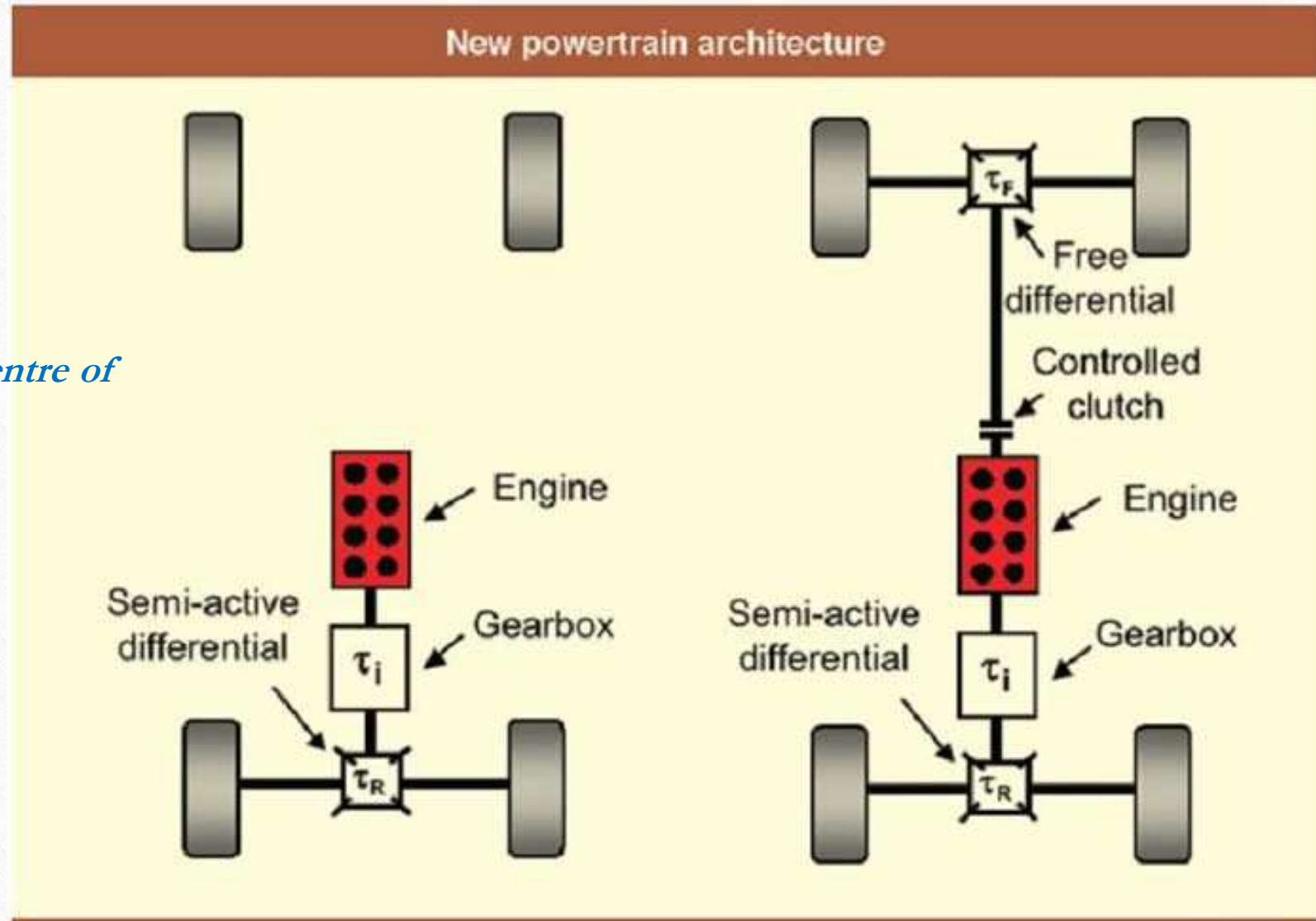


Figure 1

Engine fitted at the centre of the chassis:



- *Engine fitted at back :*

- *Real engine drive*
- *vehicles employing this system is dolphin*



Engine fitted at back



Engine fitted at back

Advantage:

- *Flat floor is available since long propeller shafts are eliminated*
- *With elimination of propeller shaft the centre of gravity lowered giving stable driving*
- *Better adhesion onroad specially when climbing hill.*

Disadvantage :

- *While Climbing hills proper adhesion may be affected since the weight of vehicles moves to the rear , thereby reducing the weight on the front wheel.*
- *As a result of grouping of the engine with clutch, gear box and differential, the repair and adjustment become difficult due to congestion at the rear.*

- *According to the Number of Wheels fitted in the vehicles and the number of driving wheels*
 - *4x2 drive chassis vehicle.*
 - *4x4 drive chassis vehicle.*
 - *6x2 drive chassis vehicle.*
 - *6x4 drive chassis vehicle.*

FRAME :

- *Frame is the main part of chassis on which remaining part of chassis are mounted.*
- *Frame should be extremely rigid and strong so that it can withstand shocks, twist, stresses and vibrations when vehicle is moving on road.*

FRAME

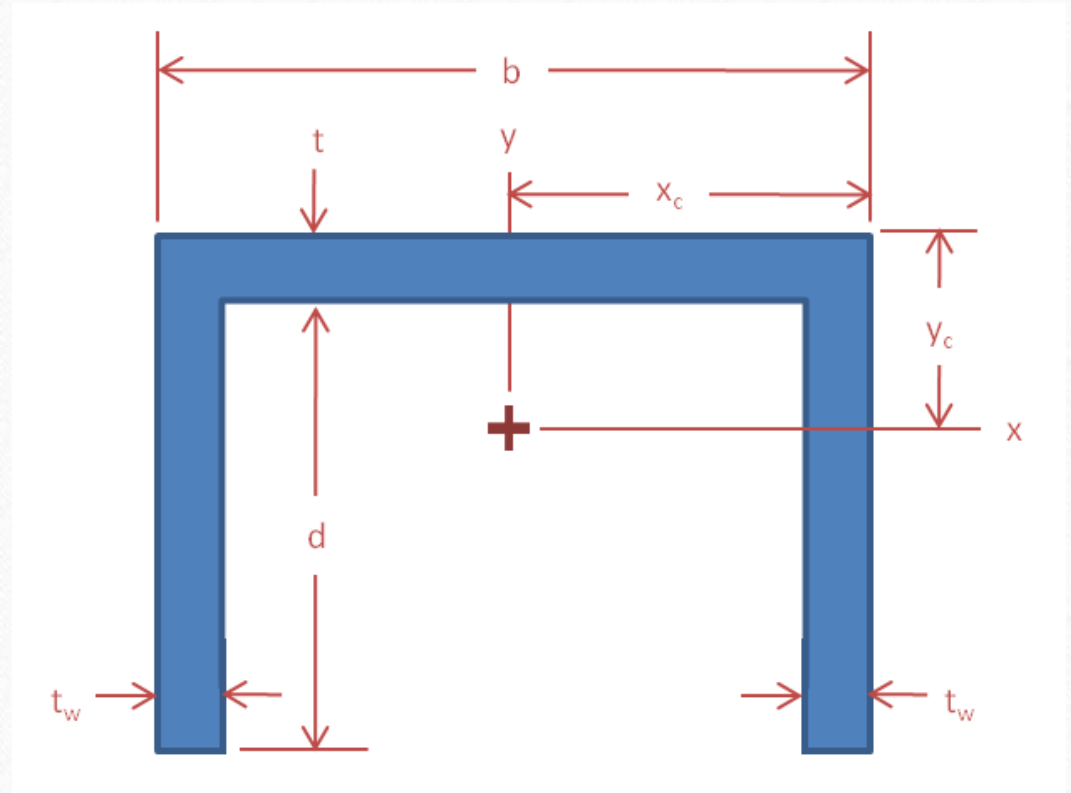


Frame are made of following sections :

- *Channel sections*
- *Box sections*
- *Tubular sections*

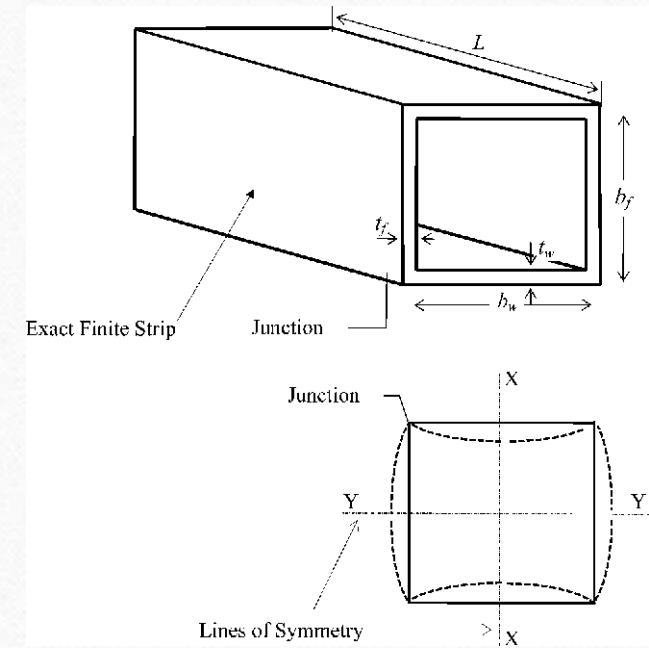
Note- Channel section good in bending , tubular in torsion & box in bending & tortion

- *Channel sections*



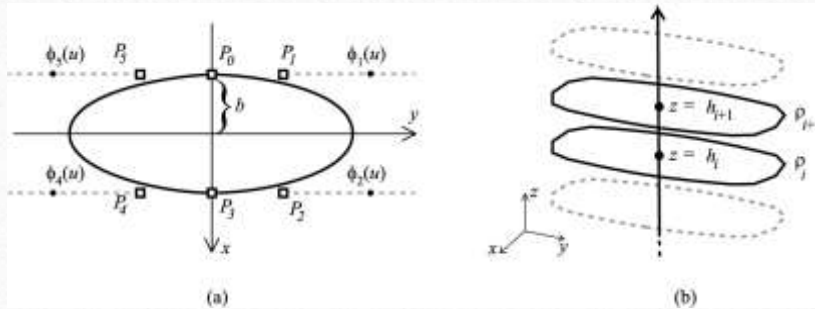
Used in long section of the frame

- *Box sections*



- *Used in short members of frames*

- *Tubular sections*



Tubular section is used these days in three wheelers , scooters pick-ups.

Types of Chassis frame:

- *Conventional Frame*
- *Integral Frame*
- *Semi Integral frame*

Conventional Frame:

- *It is also known as non load carrying frame. Here loads on the vehicles are transferred to the suspensions by frame.*
- *This type of frame is not suited to resist torsion.*

Conventional Frame.



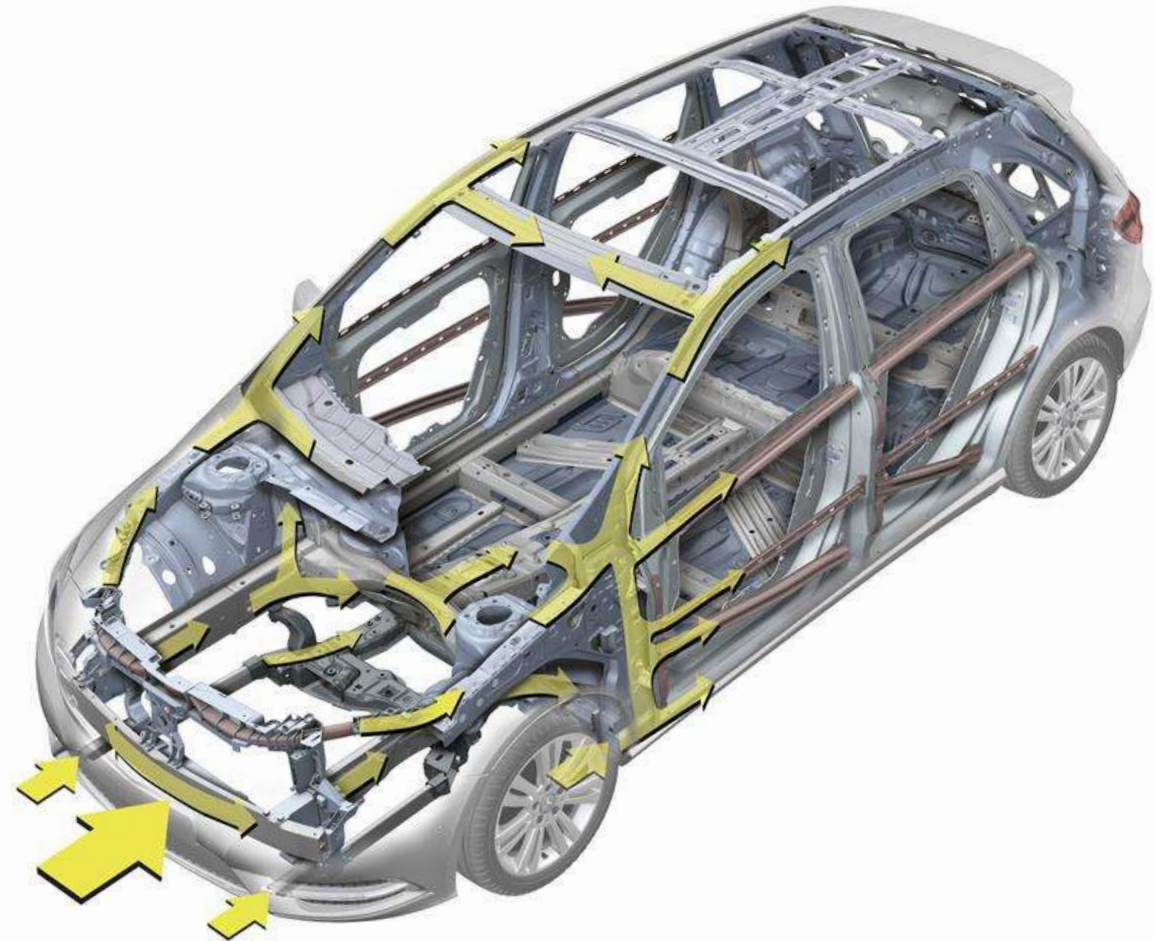
Semi Integral Frame:

- *In this type of frame load is transferred to the body structure also.*
- *This Frame however is heavy.*
- *In semi integral frame half frame is fixed in the front end on which engine gear box and front suspension is mounted.*
- This type of frame is used in some of the European & american cars



Semi Integral Frame

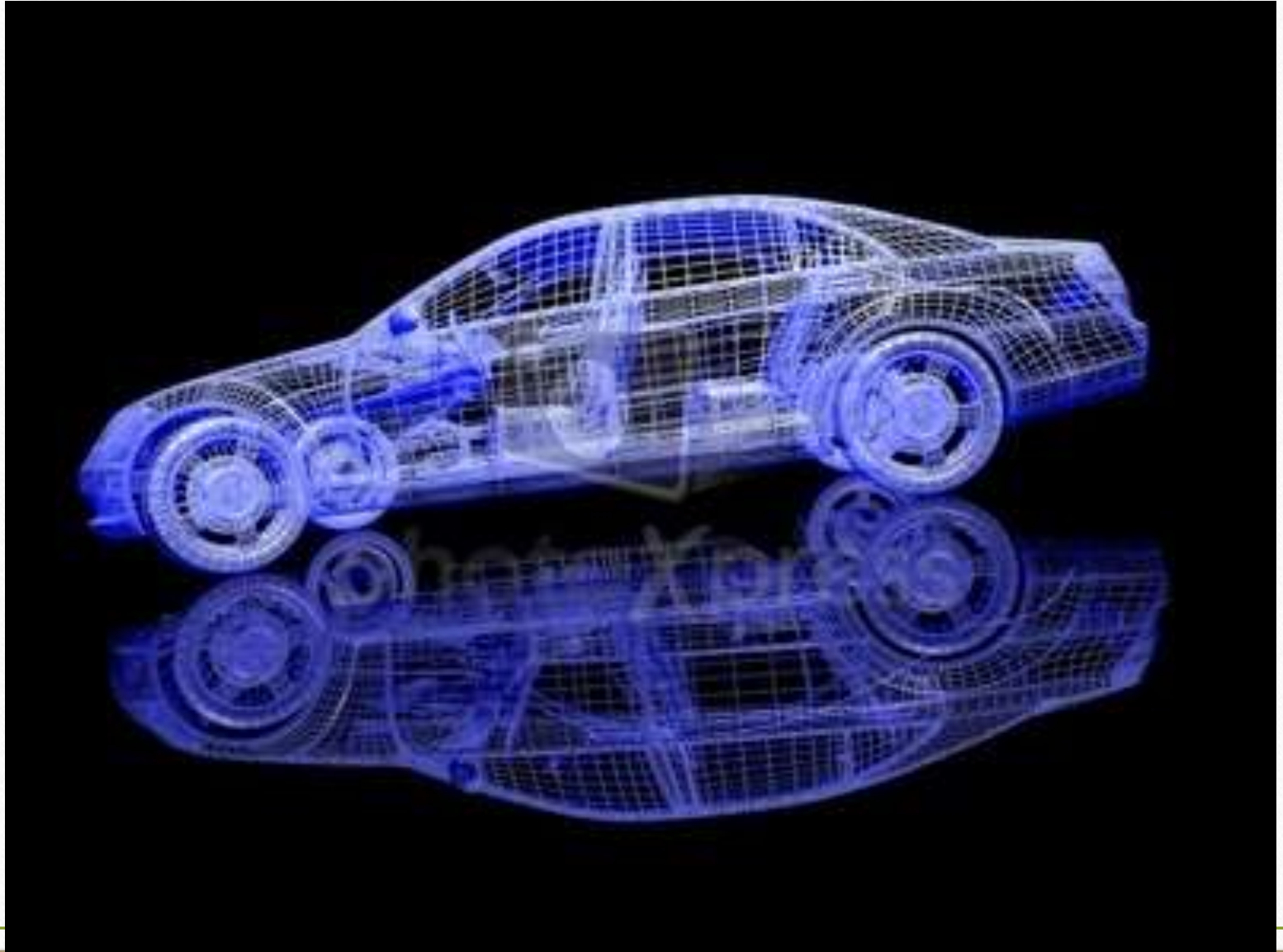
Semi Integral Frame



Integral Frame:

- *In this type of construction there is no frame and all assembly units are attached to the body.*
- *The chassis , floor and body are assembled by from a large number of mild steel pressings.*
- *This is the modern form of construction for almost all cars and lighter commercial vehicles.*

Integral Frame

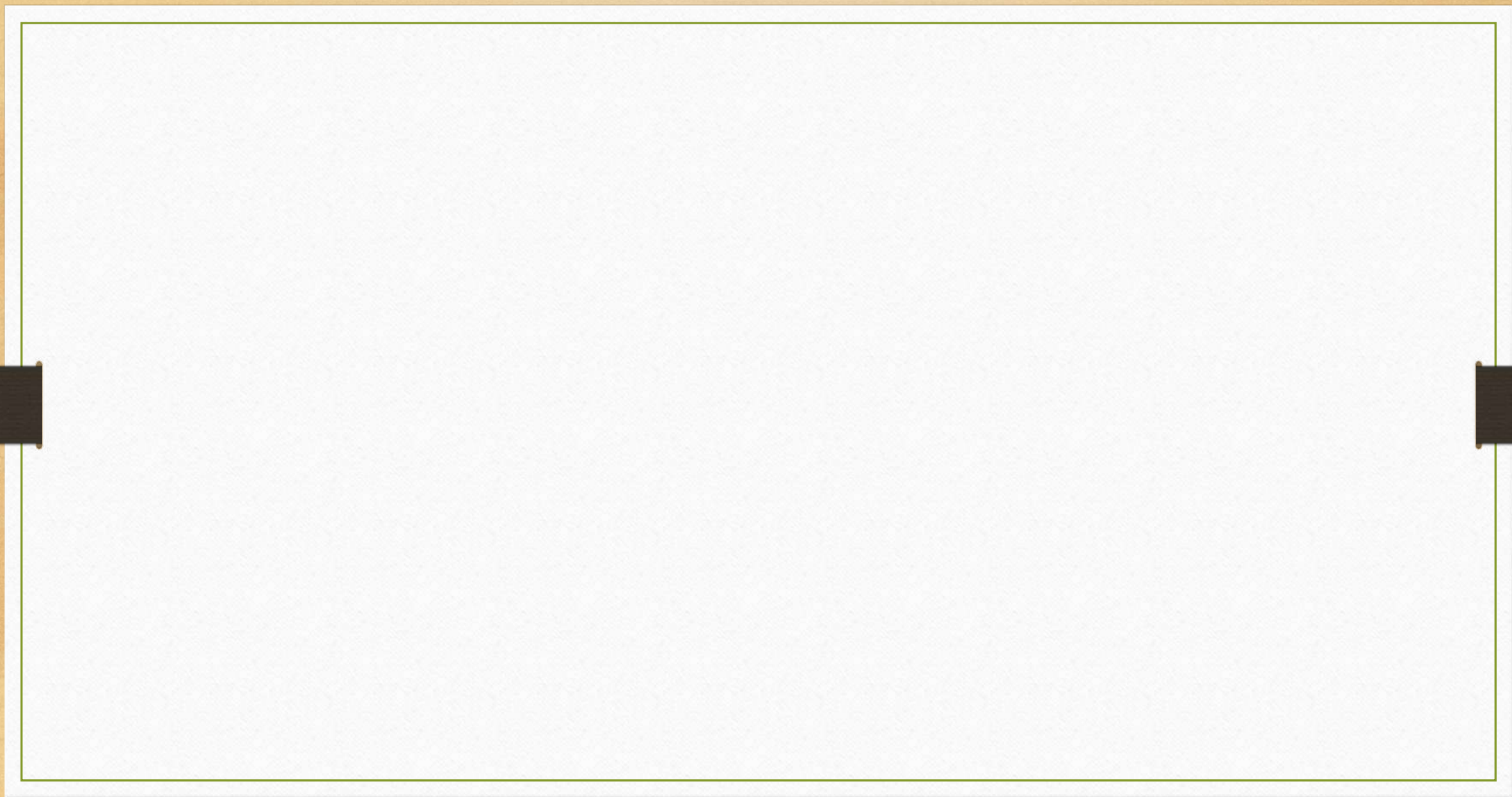


Some of important Chassis are:

- *Ladder Frame*
- *Tabular Space Frame*
- *Monocoque Frame*
- *ULSAB Monocoque*
- *Backbone Frame*
- *Aluminum Space Frame*
- *Carbon Fibre*

- *Ladder frame:*

- *The ladder frame is the simplest and oldest of all designs.*
- *It consists merely of two symmetrical rails, or*
- *This design offers good beam resistance because of its continuous rails from front to rear*
- *poor resistance to torsion*



- ***Tubular space frame:***

- *It is 3-dimensional design*
- *Tubular space frame chassis employs dozens of circular section tube, positions in different directions to provide mechanical strength against force from anywhere.*
- *These tubes are welded & forms a very complex structure.*
- *For higher strength required by sports cars, tubular space frame chassis usually incorporate a strong structure under both doors.*



- *Tubular space frame:*

Advantage :

- *Very strong in any direction
(compared with ladder chassis and Monocoque
chassis of the same weight)*

Disadvantage :

- *Very complex , costly and time consuming to be built.*
- *It engages a lot of spaces rise the door seal and result in difficult to access to the cabin.*
- *Impossible for robotized production.*

• *Who use it?*

All Ferrari before the 360M , jaguar X j220 ,TVR etc.

Monocoque:

- *Monocoque is a one-piece structure which defines overall shape of the car. while ladder , tabular & backbone provide only stress members*
- *Today 99% car produced in this planet are made of steel Monocoque chassis.*
- *.chassis are made by welding of several pieces.
(Spot winding)*
- *Monocoque is made of steel.*



• *Monocoque:*

- *Spot-winding :*

- *Two plates are connected by resistance to electric current flow & work piece are held together under pressure exerted by electrodes.*
- *The spot welded together by robot arm in stream production line.*

- *Advantage :*

- *Space-efficiency*

(the whole structure is actually an outer shell.)

- *Monocoque chassis benefit crash production .
because it uses a lot of metal.*
 - *Cheap for mass production.*

• *Disadvantage:*

- It is very heavy.
- Impossible for small volume production.

- **ULSAB MONOCOQUE:**

- *Ultra light steel auto body.*
- *It has same structure as a conventional Monocoque.*
- *It differs from its donor is in minor detail-
the use of “hydroform” parts , sandwich steel & laser
beam winding.*



Ulsab monocoque
www.ulsab.com

• *Hydroform technology:*

Advantage :

- *Stronger & lighter than conventional Monocoque without increasing production cost*
- *Compare with conventional Monocoque it is 36% lighter & 50% stiffer.*

Disadvantage:

Still not strong or light enough for the best sport cars.

Who use it???

Opel astra , BMW 3-series , Audi A8 , A2.

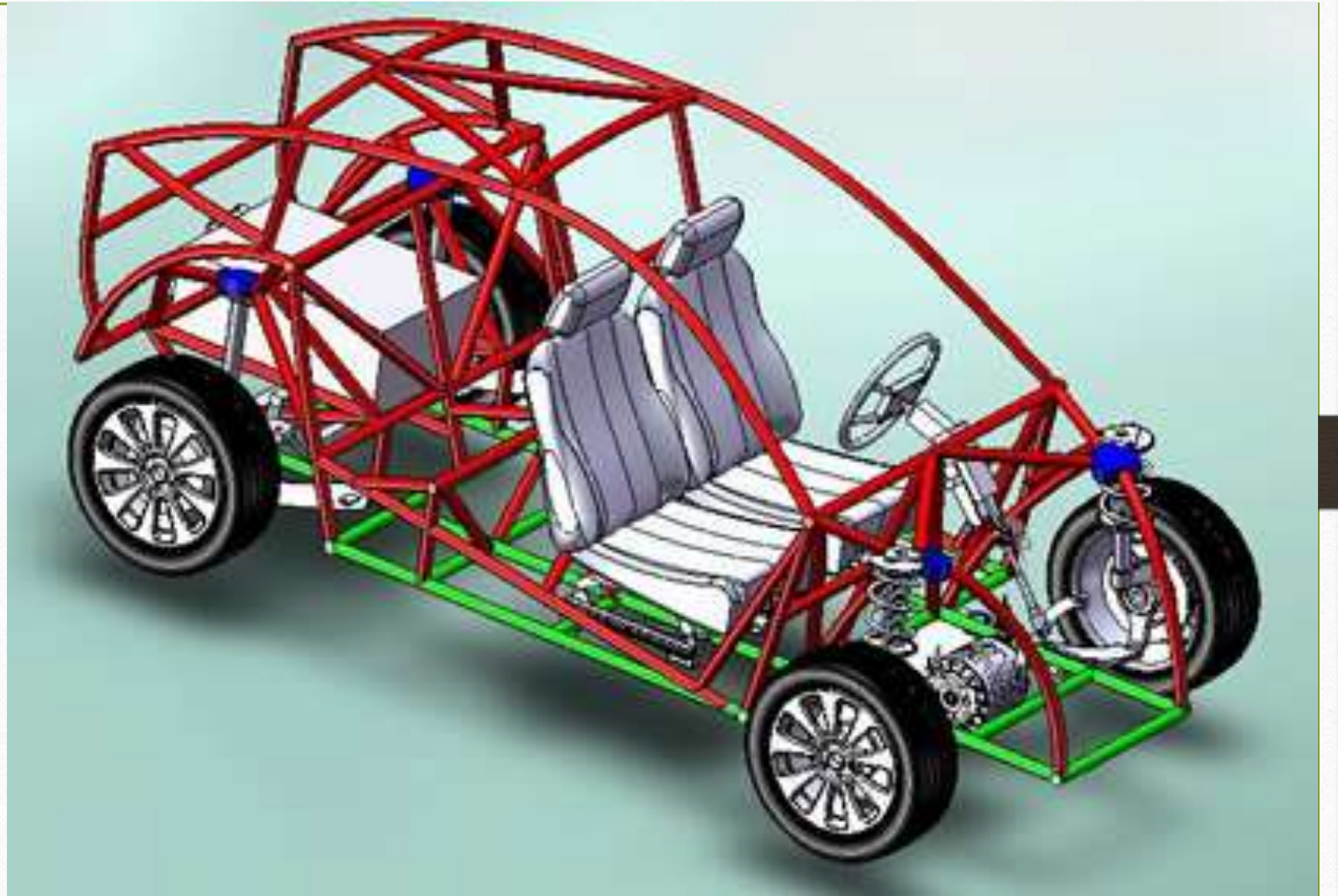
Backbone chassis:

- *Colin chapman invented backbone chassis in his elan roadstar*
- *A strong tubular backbone connects the front & rear axle & provide nearly all mechanical strength.*
- *The whole drivetrain , engine & suspensions are connected to both ends of the backbone.*
- *The body is built on backbone are usually made of glass-fibre.*
- *Its strong enough for small sports car but not upto the job high-end one.*

Backbone chassis



Backbone chassis



Advantage :

- *Eassy to be made by hand thus heap for low volume production*
- *Spce efficient*
- *Good crash production*

Disadvantage:

Does not provide protection against side impact or crash.

Who use it??

lotus esprit , elan MK11 , TVR , Marcos.

Carbon frame Monocoque:

- *Carbon fibre is found in aircraft, superbikes, spaceship, racing cars because of superior rigidity to weight.*
- *Carbon fibres are used in the bodypanels or in area where extreme stiffness & lightweight is beneficial.*

Carbon frame Monocoque





Carbon frame Monocoque

Advantage:

- The lightest & stiffest chassis.

Disadvantage:

- Most expensive.

Who use it??

Ferrari f50, Bugati EB11055..

Aluminium space frame:

- ASF consist of extrude aluminium sections ,vacume diecast component& , aluminium sheet of different thickness.
- Audi 8 is the first mass production car feacturing aluminium space frame chassis
- Developed in conjugation with us aluminium maker alco , asf is intended to replace conventional steel mnocoqueu mainly for benifite of lightness
- Audi a8 asf is 40% lighter than bmw 740 I



Aluminium space frame:

- **ADVANTAGE:**

Lighter than monocoque

- **Disadvantage:** Disadvantage:

Still expensive or mass production.

Still expensive for mass production

Who use it?

Audi

Rolls Royce

Lotus

McLaren

Mercedes

Mercedes

Mercedes