

به نام خدا

سیستم‌های شاسی و بدنه خودرو

انواع شاسی و بدنه

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Chassis Frame and body

- Chassis frame: basic structure of the vehicle
- The components of the vehicle are mounted on the chassis frame (Carrying Unit):
 - Engine or Power plant,
 - Transmission System (Clutch, Gear Box, Propeller Shaft, Differential),
 - Axles, Wheels and Tyres,
 - Suspension,
 - Controlling Systems (Braking, Steering etc.),
 - Body and Closures
 - Electrical systems.

Chassis Frame

- Functions of the chassis frame:
 1. To support the load of the body, engine, gear box, etc.
 2. To carry load of the passengers or goods carried in the body.
 3. To withstand the forces caused due to the sudden braking or acceleration
 4. To withstand centrifugal force while cornering
 5. To withstand the stresses caused due to bad road conditions.

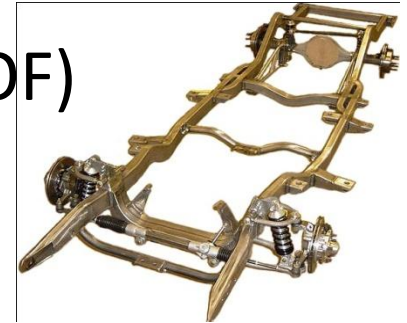
Loads Acting on the Chassis Frame

1. Static Loads - Loads due to the weight of chassis parts, passengers, etc..
2. Short duration Loads - While crossing a broken patch.
3. Momentary-duration Load - While taking a curve.
3. Impact Loads - Due to the collision of the vehicle.
4. Inertia Load - During acceleration or brake.
6. Over Loads - Beyond Design capacity.

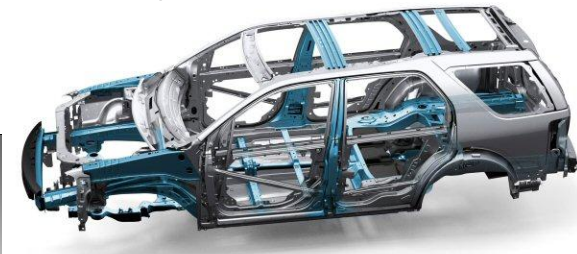
Types of Body and Chassis Frames

- According to chassis design, there are three types of body and frames:

1. Conventional frame (Body on Frame – BOF)



2. Integral frame (Body Frame Integral – BFI, Unitized Frame-Body, e.g. Monocoque)



3. Semi-integral frame



Types of Body and Chassis Frames

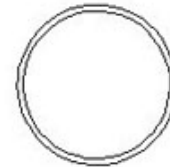
- According to usage:
 1. Light vehicle Bodies – Passenger cars,
 2. Medium vehicle Bodies - Vans, Pickups, SUVs
 3. Heavy vehicle Bodies – Busses, Trucks

Sections used in Chassis Frames

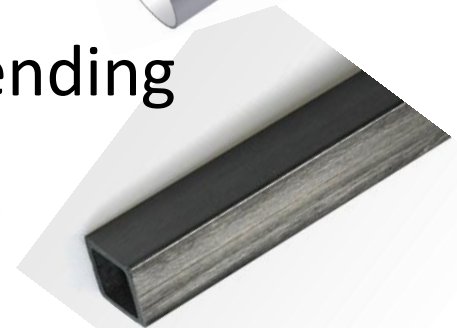
a. Channel Section - Good resistance to bending



b. Tubular Section - Good resistance to Torsion



c. Box Section - Good resistance to both bending and Torsion



Requirements of Vehicle Bodies

- The body of most vehicles should fulfill the following requirements:
 1. The body should be light.
 2. It should provide sufficient space for passengers and luggage.
 3. It should provide good vision and ventilation.
 4. It should have long fatigue life.
 5. It should withstand vibrations while in motion.
 6. It should offer minimum resistance to air.
 7. It should have a minimum number of components.
 8. It should be cheap and easy in manufacturing.
 9. It should be attractive in shape and design.
 10. It should have uniformly distributed load.

Vehicle classification methods

HLDI classification (Highway Loss Data Institute)	Definition
Sports	Those cars with significant high performance features
Luxury	Higher-end cars that are not classified as sports
Large	Length more than 495.3 cm (195 in) and wheelbase more than 279.4 cm (110 in)
Midsized	Length 457.3–495.3 cm (180–195 in) and wheelbase 266.8–279.4 cm (105–110 in)
Small	Length less than 457.2 cm (180 in) and wheelbase less than 266.7 cm (105 in)



Vehicle classification methods

NHTSA classification (National Highway Traffic Safety Administration)	Code	Curb weight
Passenger cars: mini	PC/Mi	1,500–1,999 lb (680–907 kg)
Passenger cars: light	PC/L	2,000–2,499 lb (907–1,134 kg)
Passenger cars: compact	PC/C	2,500–2,999 lb (1,134–1,360 kg)
Passenger cars: medium	PC/Me	3,000–3,499 lb (1,361–1,587 kg)
Passenger cars: heavy	PC/H	3,500 lb (1,588 kg) and over
Sport utility vehicles	SUV	-
Pickup trucks	PU	-
Vans	VAN	-

Curb (kerb) weight: Total weight of a vehicle with standard equipment, all necessary operating consumables (e.g., motor oil and coolant), a full tank of fuel, while not loaded with either passengers or cargo.

Vehicle classification methods

EPA car class (Environmental Protection Agency)	Total passenger and cargo volume (cu. ft.)
Two-seaters	Any (designed to seat only two adults)
Minicompact	Less than 85 cu ft (2,407 l)
Subcompact	85–99 cu ft (2,407–2,803 l)
Compact	100–109 cu ft (2,832–3,087 l)
Mid-size	110–119 cu ft (3,115–3,370 l)
Large	120 cu ft (3,398 l) or more
Small station wagons	Less than 130 cu ft (3,681 l)
Mid-size station wagons	130–159 cu ft (3,681–4,502 l)
Large station wagons	160 cu ft (4,531 l) or more

Vehicle classification methods

- Euro Market Segment:
 - A-segment: mini cars
 - B-segment: small cars
 - C-segment: medium cars
 - D-segment: large cars
 - E-segment: executive cars
 - F-segment: luxury cars
 - S-segment: sports, coupés
 - M-segment: multi purpose cars (MPV)
 - J-segment: sport utility cars (including off-road vehicles)



UNECE

Vehicle classification methods

- United Nations Economic Commission for Europe (UNECE) ECE/TRANS/WP.29/78/Rev.4:2016

Category L – Motor vehicles with less than four wheels (L1-L7)

Category M - Power-driven vehicles having at least four wheels and used for the carriage of passengers (M1, M2, M3)

Category N - Power-driven vehicles having at least four wheels and used for the carriage of goods (N1, N2, N3)

Category O - Trailers (including semi-trailers) (O1-O4)

Categories T, R and S- Agricultural vehicles

Category G - off-road vehicles

Car Body Styles

- Sedan, Saloon (Br.E.)
- Hatchback, Nothback, Liftback
- Station Wagon, Estate (Br.E.), Touring)
- Coupé
- Convertible, Cabriolet, Roadster, Spider
- SUV, Crossover (CUV)
- Luxury (Flagship models)
- Van (MPV)
- Special purpose vehicles (Caravan, Armoured vehicle, Ambulance, Hearse)

Car Body Styles

- Sedan (Saloon)



2014 Mercedes-Benz C-Class C350 Sedan

Car Body Styles

- Wagon (Estate, Touring)

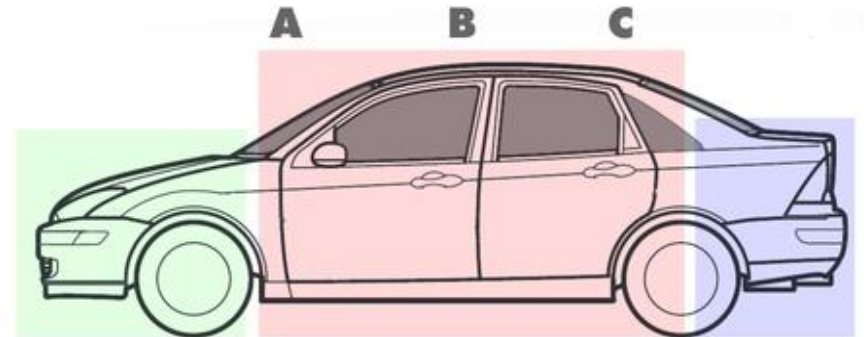


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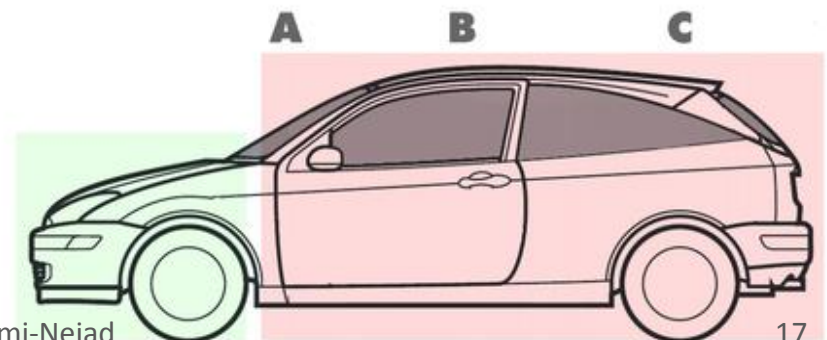
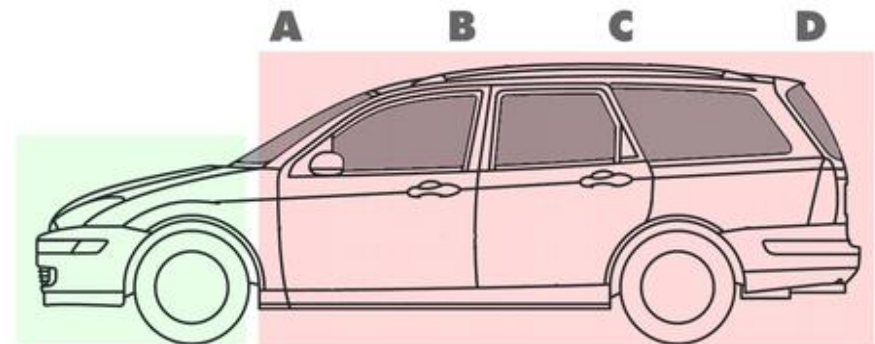
2014 Mercedes-Benz E-Class E350 Wagon

Car Body Styles: Sedan, Wagon, Hatchback

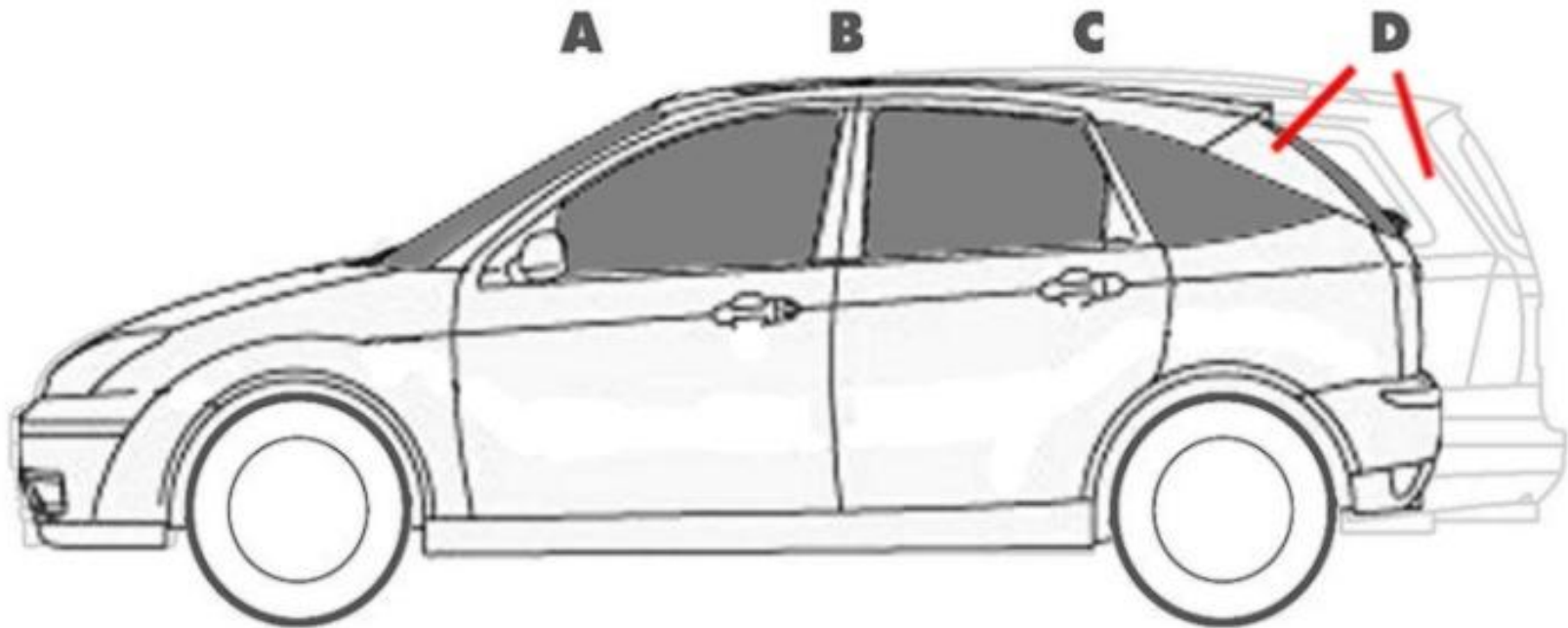
- Number of separate compartments (2 or 3)



- Number of columns (3 or 4)



Station Wagon vs. Hatchback



Car Body Styles

- Coupe



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2014 Mercedes-Benz C-Class C350 Coupe

Car Body Styles

- Coupe



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2014 Mercedes-Benz E-Class E550 Coupe

Car Body Styles

- Convertible (Cabriolet, Roadster)



2014 Mercedes-Benz E-Class E550 Cabriolet

Car Body Styles

- Convertible (Cabriolet, Roadster)



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2014 Mercedes-Benz SLK-Class SLK350 Roadster

Car Body Styles

- Van (MPV)



2013 Mercedes-Benz Sprinter 2500 Van



2012 Mercedes-Benz Sprinter 3000 Van



Car Body Styles

- Crossover (CUV, SUV)



2014 Mercedes-Benz GL-Class GL550 Crossover

Car Body Styles

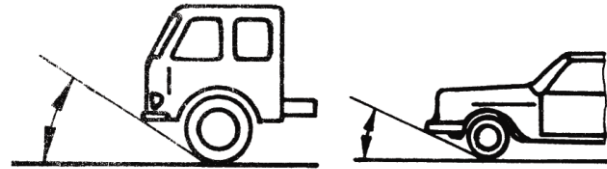
- Luxury (Flagship models)



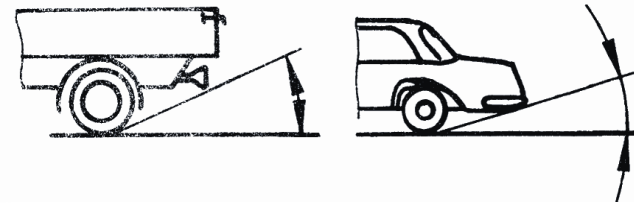
2014 Mercedes-Benz CLS-Class CLS550 Luxury

Incidence angles, ramp angle and ground clearance

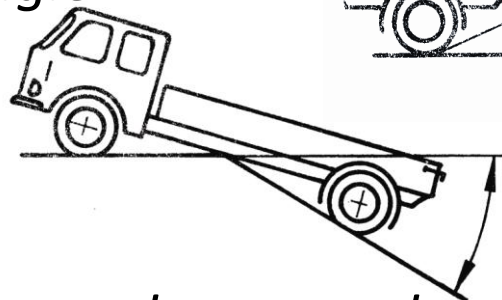
- *Approach angle*



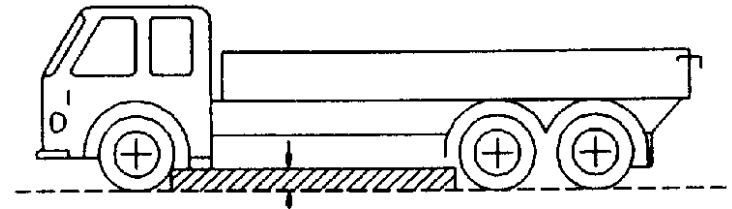
- *Departure angle*



- *Ramp angle*



- *Ground clearance between the axles*



- *Ground clearance beneath one axle*

