

What is vehicle crashworthiness & importance of CAE?

Classification of Vehicle :

L TYPE VEHICLES : *It includes all vehicles having less than four wheels and Light four wheelers.*

L1 : *A two-wheeled vehicle, not exceeding 50 cc, not exceeding speed 50 km/h.*

L2 : *A three-wheeled vehicle ,not exceeding 50 cc, not exceeding speed 50 km/h.*

L3 : *A two-wheeled, exceeding 50 cc, exceeding speed 50 km/h.*

L4 : *A three-wheeled (Asymmetric)not exceeding 50 cc, exceeding speed 50 km/h.*

L5 : *A three-wheeled (symmetric)not exceeding 50 cc, exceeding speed 50 km/h.*

L6 : *A vehicle with four wheels whose unladen mass is not more than 350 kg , speed is not more than 45 km/h.
and not exceeding 50 cc or not exceeding power output of 4kw.*

L7 : *A vehicle with four wheels whose unladen mass is not more than 550 kg and not exceeding power output of 14 kw.*

Classification of Vehicles :



M TYPE VEHICLES : *It includes all vehicles having at least four wheels and used for the carriage of passengers.*

M1 : used for carriage of passengers, comprising not more than eight seats in addition to the driver's = 9

M2 : used for carriage of passengers, comprising more than eight seats in addition to the driver's = 9 and mass not exceeding 5 tonnes.

M3 : used for carriage of passengers, comprising more than eight seats in addition to the driver's = 9 and mass exceeding 5 tonnes.

N TYPE VEHICLES : *vehicles used for carriage of goods.*

N1 : used for carriage of goods, and mass not exceeding 3.5 tonnes.

N2 : used for carriage of passengers, and mass between 3.5 tonnes to 12 tonnes.

N3 : used for carriage of passengers, and mass exceeding 3.5 tonnes.

O TYPE VEHICLES : *Includes semi trailers and trailers*

Full Frontal Impact :

With increased structural stiffness lead to higher decelerations in vehicle compartment leading to higher chest injuries.



ODB (Offset Deformable Barrier) impact:



Head on collision with just portion of colliding vehicles or so called percentage of overlap.

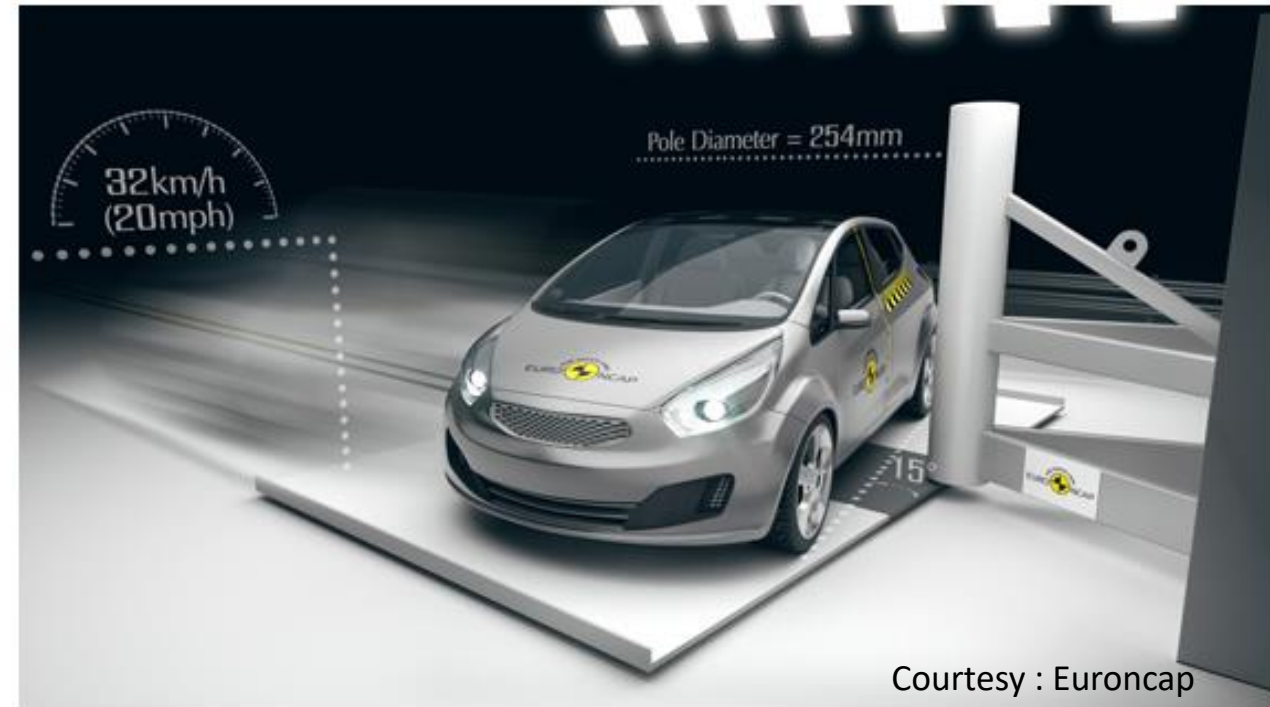
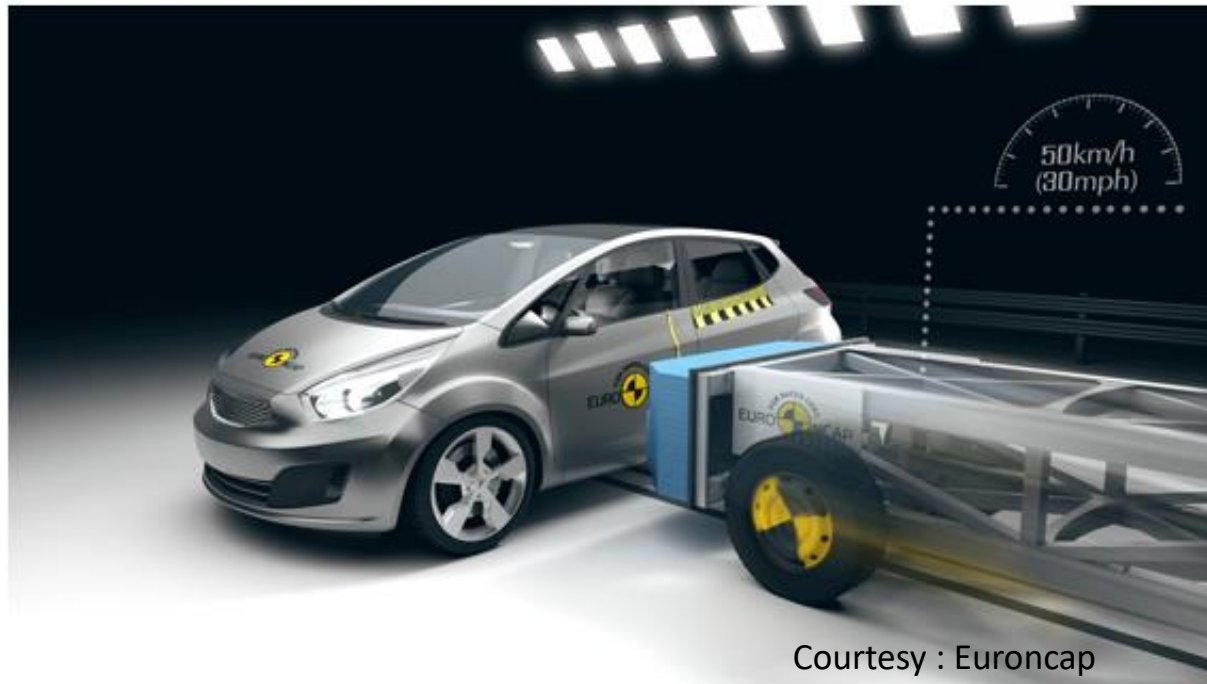


Courtesy : Euroncap

Side Impact /Side pole impact:

second highest frequency crash leading to several injuries to head and chest due to lesser interior space to absorb energy in side impact.

Pole impacts simulate vehicle travelling over poles or trees due to loss of control over vehicle from driver.



Roof crush :

Protection of passengers due to roll over crashes.
(Static Equivalent of dynamic Scenario)



Vehicle safety Standards across countries :

▪ **Government Bodies :**

1. **Federal Motor vehicle safety standard (FMVSS)**
2. **Economic commission of Europe (ECE)**
3. **Automotive Indian Standards (AIS)**

▪ ***Non Government Bodies :***

1. **National Highway Traffic Safety Administration (NHTSA)**
2. **Insurance Institute for Highway Safety (IIHS)**
3. **NCAP.**

Vital Role Of CAE :



- Traditional analytical methods fails solving complex real time engineering problems involving over redundancy.
- Large Human efforts and time is required to solve complex engineering problems .
- Experimental methods need prototypes builds and repeat testing involves high costs.
- CAE can produce cost optimal & light weight design solutions.
- CAE results not necessarily require prototypes and they can match up testing requirements.

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