

## Pedestrian Safety & Certification Lab GARC-Chennai

NATRIIP has provided another facility in Southern automotive hub by successfully commissioning the Pedestrian safety & certification lab at GARC-Chennai. The labs are equipped with state of art facility and part of the Passive Safety Lab. The lab is capable of homologation and R&D for pedestrian safety, occupant safety windows retention, head and seat retention etc. as per nation and international standards. The labs have following components:

- 1) **Pedestrian Lab-Universal Launcher.**
- 2) **Head & Seat Restraint Test Rig.**
- 3) **Windows Retention Test Rig.**
- 4) **Fuel Tank Pendulum.**
- 5) **Interior fitting Test Rig.**
- 6) **Bumper Pendulum.**
- 7) **Traction Compression Machine.**
- 8) **Dummies.**

### Pedestrian Lab Universal Launcher

This equipment is the state of art facility, which is equipped with several components which are able to perform various test related to pedestrians and occupants of the vehicle during the crash.



Universal Launcher



Pedestrian Safety Lab

A) **Function of Lab:** The pedestrian lab is constituted with several components and able to perform following tests:

- 1) **Body Block Test:** This test is used to check the impact on drivers from the steering control system. The test is useful to know and the impact on chest of driver during collision and useful to take corrective measures during design and development of vehicle for drivers protection.



Body Block

- 2) **Ejection Mitigation:** The test is useful to reduce the likelihood of complete and partial ejection of occupant through side windows during rollover or side impact. This is also useful to establish requirement for ejection mitigation system.



Ejection Mitigation

- 3) **Head Form Test:** There are two head form test perform by the equipments **Free Form Head** test and **Guided Head Form test**. The **Head Form** test is use to derived more varied result on head injuries during impacts and can perform on modified head or in conjunction of dummies. The head form test is useful in development of safer vehicle interiors and exteriors in pedestrian impacts . This is also helpful in test of personal safety gears and having great importance of protecting the head from injuries in accidents.



Guided Head Form Test



Free Form Head Test

- 4) **Leg Form Test:** The Leg Form test is useful to test the impact of collision on pedestrian legs. The equipments are able to perform two types of test the **Lower Leg Form & Upper Leg Form** test on pedestrian. The result of these tests help in study of the impact on legs of pedestrian as well as design & development of bumper, bonnet, Engine compartments and material used in these structures.



Lower Leg Form Test



Upper Leg Form Test

**B) Technical Details :** The Lab is able to perform test on passanger cars, SUV's & LCV with a vehicle of following dimensions.

**Width:** 2.5 mtr., **Height:** Up to windscreen 2 Mtr. & Up to Front Bonnet 1.25 Mtr., **Weight :** 3500 Kg.

### Head Restraints Test Rig

Head restraints test rig is used to test the head restraints of M1 category vehicle. The head static load test system of this rig is designed to check the behavior of seats and headrest during rear impact tests. The system is will apply constant torsion to a specific point on the seat called 'H' point by using dummies and shapes like human backs and a system of calibrated load actuators for up to three seats and accurately measures the maximum deformation angles. The system is also tests height retention. Thus the system is able to test the seatback and its adjustment system as well as performance of head restraint.



### Head Restraints Test Rig

**Technical Specification:** The system has following technical capabilities:

- a) Three seating positions.
- b) The system shall allow testing benches.
- c) Displacement of H point of every device in X axis and Z axis :  
Approx. range X = 1.5 & Z= 1.5.
- d) 1 Electrical Force actuator: Force enough to apply a torque around the R point of 530 Nm.
- e) 1 Electrical Force actuator : Force enough to apply a linear force of 890 N.
- f) Spherical head form: 165 mm. Diameter.

## Interior Fitting Test Rig

Interior Fitting test rig is used to test the Interior parts of the passenger compartment other than the interior rear-view mirrors, layout of the controls, the roof or sliding roof, the backrest and rear part of the seats like body shell, instrument panel with steering column and steering wheel assembly. The rig is able to test energy dissipating materials.



## Interior Fitting Test Rig

**2. Technical Details:** The rig consist following equipments, the details are given below:

### **2.1 Pendulum:**

The pendulum equipped with self-triggered brake avoiding bounces and rebounds after first impact.

- Impactor: head form of 165 mm diameter.
- Impact energy continuously adjustable up to 235 J (Rated impact energy corresponding to a reduced mass of 6.8 kg at 24.1 km/h).
- Impact speed continuously and automatically adjustable by software up to 30 km/h.
- Inertia moment adjustable to achieve desired Impact energy at any length.
- Length from pivot hip to the top of the head shall be continuously adjustable.
- The instrumentation enable the action to be recorded throughout its duration & reading to be made to within one thousandth of a second.

### **2.2 Accelerometers:**

- Impactor fitted with 2 accelerometers and a speed transducer in the direction of impact.
- Accuracy  $\pm 1.5$  % accuracy and ISO 648-1987 class 1000, 600 and 180 frequency data channel selectable
- Frequency response up to 1,500 Hz.
- Cross axis sensitivity is as per IS 15223.

### **2.3 Speed sensor:**

- Accuracy  $\pm 1$  % of the real value.
- Sensitivity 0.25 km/h.

### **2.4 Sample holder:**

The system shall include a structure to mount the sample and allow it to be rotated around the z and y axis and movement along the z axis.



## Fuel Tank Pendulum

Fuel Tank Pendulum is used to test impact resistance of Plastic Fuel Tank for four wheeler.



## Fuel Tank Pendulum

**Technical Specifications:** Following are the technical details of fuel tank pendulum:

- Steel, equilateral, square basis pyramid rounded to 3 mm. radius impactor.
- Percussion centre coincident with centre of gravity of the pyramid.
- Percussion arm of 1 m.
- 15 kg. reduced mass.
- 30 Nm. impact momentum

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## Window Retention Test Rig

Window Retention test rig is used to test the Window retention and release systems of buses.



## Window Retention Test Rig

### Technical Specifications:

- 140 mm. support diameter.
- Sugar pine block, 75 mm. radius. Longitudinal grain.
- Synthetic under layer:  $0.63 \pm 0.06$  mm. thick; tensile strength  $17.5 \pm 1.75$  kg/cm<sup>2</sup>.; elongation  $50 \pm 10\%$ .
- Napa goat skin or synthetic skin:  $0.76 \pm 0.07$  mm. thick; tensile strength  $70 \pm 3.5$  kg/cm<sup>2</sup>.; elongation  $100 \pm 5\%$ .
- To apply a linear force of 890 N.
- Spherical head form: 165 mm. diameter.

## Bumper Pendulum

The bumper pendulum is used to perform test on vehicle bumper. The equipment has capability of Adjustable ballast and measure point of impact, Test cart with adjustable center of gravity & Load cell instrumentation. The equipment is useful in improving bumper quality and design.



## Bumper Pendulum

## Traction Compression Machine

Traction and compression machine is used for testing of compression and traction of metals, Polymers and biomaterials.



## Traction Compression Machine

### Dummies

The dummies are useful to test and measure impact on human bodies. These dummies have high quality sensors through which one can measure the real impact of crash, strain and compression etc. on human body without use of any real human interface. The uses of dummies are helpful in understanding the impact on human body. There are 32 dummies that will be utilized for crash test related activities in Pedestrian and Advance Passive Safety Lab. There are following types of dummies:

- Hybrid III 50<sup>th</sup> Percentile.
- Euro SID 2.
- Euro SID 2 Rib Extension.
- SID II Dummy.
- Hybrid III 3 Year old child.
- Hybrid III 6 year old child.
- CRABI 12 month infant.
- BIORID II Rear Impact Dummy.
- TNO 10 (Seat Belt Safety in simulated Crash Dummy).
- P Series dummies – Po, P3/4, P3/2, P3, P6, P10.
- Q Series dummies – Q0, Q1, Q1/2, Q3, Q6, Q10.

Apart from the mentioned dummies, various other calibration equipments for these dummies is also available.



### Dummies

### Benefits of testing Facilities

The testing facilities will enhance the safety of Automotive vehicles in the India also safety of the pedestrian & persons inside the vehicle is of utmost important which will be achieved through enhancing safety of the vehicles. Thus these facilities opens up way for strengthening the security standards in India as well as testing of vehicle improves the reliability on the vehicle automatically this leads to increase in brand image of Vehicle manufacturer.

### Automotive regulations compliance capacity of equipments

The equipments of the labs are able to perform test as for following national and international regulations and standards:

- For Pedestrian Safety

- IS 15546-2005: Automotive vehicles – Seats, their anchorages and head restraints for category M1 – Specifications.
- EEC Directive 78/932 as amended by 2006/96: Approximation of the laws of the Member States relating to head restraints of seats of motor vehicles.
- ECE 17R07 Uniform provisions concerning the approval of vehicles with regard to the seats, their anchorages and any head restraints.
- ECE 25R04 Head restraints not incorporated in vehicle seats
- FMVSS 202a: Head restraints & 201.
- AIS -023,100.
- GTR 9.TRIAS 63-2004.
- JNCAP – Pedestrian testing.

- For Interior Fitting Test Rig:

- IS 15223 : Automotive vehicles – Interior fittings - Specification
- ECE 21R01 Regulation: Uniform provisions concerning the approval of vehicles with regard to their interior fittings.
- EEC Directive 74/60 as amended by 2000/4 relating to the interior fittings of motor vehicles (interior parts of the passenger compartment other than the interior rear-view mirrors, layout of the controls, the roof or sliding roof, the backrest and rear part of the seats).
- IS 11939: 1996: Automotive vehicles – Steering control systems – Impact protection requirements and methods of measurement.
- ECE 80R03 Uniform provisions concerning the approval of seats of large passenger vehicles and of these vehicles with regard to the strength of seats and their anchorages.
- ECE 17R07 Uniform provisions concerning the approval of vehicles with regard to the seats, their anchorages and any head restraints.





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- IS 15546-2005: Automotive vehicles – Seats, their anchorages and head restraints for category M1 – Specifications.
  
- **Fuel Tank Pendulum:**
  - AIS – 033: Automotive vehicles – Plastic fuel tank for four wheelers.
  - EEC Directive 70/221 last modified by 2006/20: Liquid fuel tanks and rear protective devices for motor vehicles and their trailers.
  
- **Windows Retention Test Rig:**
  - IS 13944 : 1994: automotive vehicles – Window retention and release systems for buses – safety requirements.