

# CAD-CAE LAB



## Photograph(s) of Key Facility



## Introduction of Lab or Facility

ICAT is having Computer Aided Design (CAD) and Computer Aided Engineering (CAE) facilities which have come up as the key product development techniques for all manufacturers. Engineering design and analysis plays an important role in the product development. Considering the global competition in the automotive market, the product development needs to be accurate, cost effective and time bounded. We at CAE are offering customized solution from vehicle concept to certification through simulation

## Capabilities

- CAD
- Strength and Durability Analysis
- Thermal Analysis
- CFD Analysis
- NVH Analysis
- Crash/Impact Analysis
- Multi-Body dynamics

## Specific Capabilities / USPs

- Simulations
  - Natural Frequency of bus structure
  - Rollover analysis of bus structure
  - UBS-II
- Hardware
  - High-performance computing cluster
  - Capability to solve full crash simulations.
  - Altair PBS Job Scheduler for Job Management

## Details / Brief Specifications of Test Facilities:

### ➤ CAD

- Solid, Surface Modelling and Assembly
- Manufacturing Drawing
- GD&T
- Design Optimization



### ➤ Strength and Durability Analysis

- Component Structural Analysis
- Low-cycle & High-Cycle fatigue analysis
- Transient Shock Analysis
- Nonlinearity – Contact, Geometry & material



### ➤ Thermal Analysis

- Powertrain cooling
- Thermal shock for electronics component
- Exhaust system simulation
- Battery Thermal Simulation
- Thermal Stress fatigue analysis



### ➤ CFD Analysis

- Port flow & Exhaust system analysis
- FSI-Fluid Structure Interaction
- Battery cooling
- Conjugate heat transfer analysis

### ➤ NVH Analysis

- Components Modal Analysis.
- Harmonic Analysis
- Random Vibration and Vibration Fatigue analysis



### ➤ Crash/Impact Analysis

- Correlation to physical prototypes
- Energy Management Strategy
- Evaluation of FOPS & ROPS for Construction Equipment & Mining Vehicles
- Design of Vehicle Barriers (Bollard / Blocker)

### ➤ Multi-Body dynamics

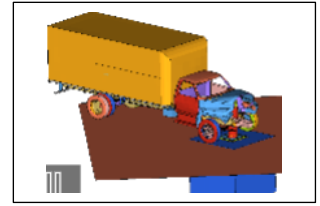
- Mechanism Simulation
- Calculation of forces through MBD
- Vehicle dynamics



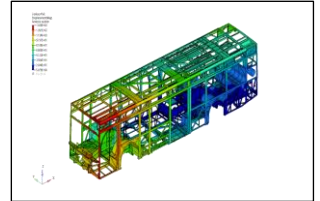
## Key Projects Executed:

Design of Vehicle Bollard Barrier and Evaluation as per

ASTM F2656 / PAS 68 / IWA 14-1

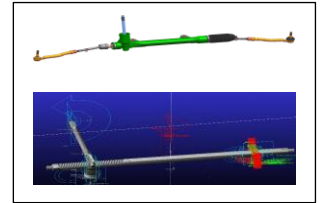


The Bus is tested as bump and torsional analysis as per the standard of mentioned in UBS-II



Design and development of the Manual Rack and

Pinion Cross-Helical Steering Gear



## Standards / Regulations (National & International):

| Segment    | Test                                                            | Standard                  |
|------------|-----------------------------------------------------------------|---------------------------|
| TRAILER-PV | Physical Verification - Dimensional Checks                      | AIS-113                   |
|            | Installation Requirement of Lighting and Signalling Device      | AIS-008 (Rev.1)           |
|            | Interchangeability Of Mechanical Coupling of Semi-Trailers      | IS 8007:2004              |
|            | Spray Suppression System Test (Installation Level)              | AIS-013 (Rev.1)           |
|            | Physical Verification - External Projection                     | IS 13942:1994             |
|            | Vehicle Maneuverability Requirement Test & Vehicle Weighment    | IS 12222:2011             |
|            | Strength and installation test of SUPD                          | IS 14682:2004             |
|            | Strength and installation test of RUPD                          | IS 14812:2005             |
| 2-W        | Protective Devices for Two Wheeled Motor Vehicles (Saree Guard) | AIS-166                   |
| CEV        | Evaluation of Min. Operator Space Envelop                       | ISO 3411:2007             |
|            | Evaluation of ZOR, ZOC                                          | ISO 6682:2008             |
| BUS        | Bus CG measurement                                              | IS 11849:2024             |
|            | Modal analysis of bus structure                                 | AIS-153                   |
|            | Rollover analysis of bus structure                              | AIS-031                   |
|            | Rollover analysis of sleeper bus structure                      | AIS-119 (Rev.1)           |
|            | Bus stability                                                   | AIS-052 (Rev.1)           |
|            | Strength and installation test of SUPD                          | IS 14682:2004             |
|            | Physical verification of Bus                                    | AIS-052 (Rev.1) & AIS-153 |
|            | Lighting installation and signalling device                     | AIS-008 (Rev.1)           |
|            | External Projection                                             | IS 13942:1994             |
|            | Handholds                                                       | AIS-046                   |
| TRUCK      | Truck cabin Front, roof & rear strength test                    | AIS-029                   |
|            | Load body strength test                                         | AIS-093 (Rev.1)           |
|            | FUPD Physical verification and simulation                       | AIS-069                   |
|            | Physical verification as per AIS 093                            | AIS 093 (Rev.1)           |
|            | Lighting installation and signalling device                     | AIS 008 (Rev.1)           |
|            | Spray Suppression Installation                                  | AIS-013 (Rev.1)           |
|            | External Projection                                             | IS 13942:1994             |
|            | Handholds                                                       | AIS-046                   |

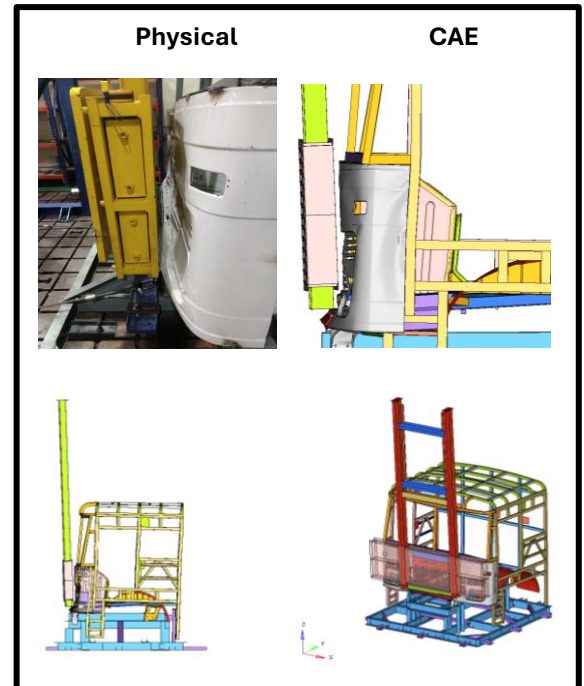
## Correlation & Benchmarking:

### Objective

To perform the CAE of Frontal Impact of the Truck CAB as per AIS 029 and validate from the physical model.

### Scope

- The frontal impact of the truck cabin is performed as per AIS 029 impact condition
- Energy absorption evaluation simulation done as per ISO IWA 14-1 standard using RADIOSS.
- The physical test is performed in the ICAT facility
- Result is compared of CAE and Physical and study the correlation

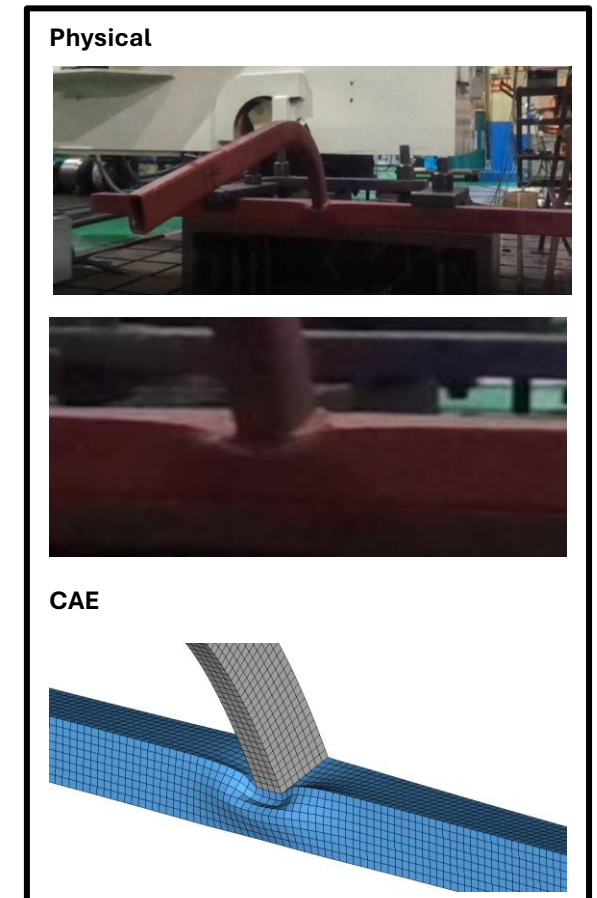


### Objective

To conduct computer-aided engineering (CAE)-based structural analysis of the bus roof joint and perform physical correlation to validate stress, deformation, and structural behaviour under specified loading conditions.

### Scope

- Develop CAD and FE models of the bus roof joint.
- Perform CAE-based structural analysis under relevant load conditions.
- Evaluate stress, strain, and deformation behavior.
- Identify critical regions in the joint.
- Correlate CAE results with physical test data for validation.
- Result is compared of CAE and Physical and study the correlation



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