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ARAI
Progress through Research

VEHICLE EVALUATION LABORATORY

Preferred Partner for Vehicle Evaluation



THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

VEHICLE EVALUATION LABORATORY - Preferred Partner for Vehicle Evaluation

The Vehicle Evaluation Laboratory (VEL) of ARAI, known as the "Laboratory on Wheels" has been operational since 1980 and is engaged in field testing of a wide spectrum of vehicles ranging from 2-Wheelers to HCVs, Construction Equipment Vehicles (CEVs), Automotive Trailers, Agricultural Tractors, , Power Tillers, Sugarcane Harvesters as well as Alternate Fuelled Vehicles viz. CNG, LPG, LNG, Hydrogen Electric Vehicles (EVs) etc., in accordance with Central Motor Vehicle Rules, 1989 (as amended up-to-date). To facilitate time-bound and quality service, vehicle evaluation services are offered at various proving grounds and manufacturers premises in India or Abroad.

Additionally, the Department also undertakes Vehicle Validation trials and Developmental trials as per various National & International standards viz. FMVSS, ADR, NZS, ECE, ISO, JASIC, etc. for domestic and overseas clients. All the services offered by VEL are NABL accredited.

Traditional Services Offered (Certification / Developmental) :

- ◆ Evaluation of Braking & ABS Performance for all category of vehicles as per IS 11852:2013, ECE R13H, IS 15986:2015, 71/320/EEC, ADR 31/02, ADR 35/03, SAANS:20013, IS 14664:1999, IS 14664:2010, GTR 3 & GB 20073:2006, AIS : 150, ECE R 78.
- ◆ Gradeability Test for all Vehicles as per AIS : 003 - 1999, AIS : 049, AIS : 151, IS 13988 : 2014.
- ◆ Coast Down Test for all category of Vehicles as per IS 14785:2000, ECE R 83 & AIS : 137.
- ◆ Pass-by Noise Level Measurement Test for M, N and L category of vehicles as per IS 3028-1998, IS 3028-2018, SAANS:20041, ADR 83/00, ECE R 41.04, ECE R51, 70/157/EEC, ECE R63, GB 16169:2005 & GB 4569:2005.
- ◆ Interior Noise Level Measurement Test for N2 / N3 and M2 / M3 category of vehicles as per AIS 020, IS 12832:2010.
- ◆ Measurement of Vehicle Dimensions as per IS 9435:2004.
- ◆ Measurement of Maximum Speed as per IS 10278:2009, IS 11877:1986, ECE R68, 95/1/EEC, 2006/27/EC.
- ◆ Constant Speed Fuel Consumption Measurement.
 - ◆ As per IS 10881 : 1994 for 2-Wheelers
 - ◆ As per IS 11921 : 2020 for Other than 2-Wheelers
- ◆ CSFC Test of LPG and CNG fuelled vehicles as per IS 11921:2020.
- ◆ Measurement of Turning Circle Diameter and Turning Circle Clearance Diameter for all vehicles other than 2 wheelers as per IS 12222 : 2011.
- ◆ Speedometer Calibration as per IS 11827 : 2008 and ECE R 39 for all Vehicles.
- ◆ Measurement of Wheel Guard as per IS 13943 : 1994.
- ◆ Steering Effort Measurement for all vehicles other than 2-Wheelers as per IS 11948: 1998, IS 11948: 2010, ECE R 79.
- ◆ Hood Latch Test (for all four wheelers fitted with a front bonnet) as per IS 14226 : 1995.
- ◆ Odometer Calibration as per IS 11850 : 1998 & ECE R 39 for all vehicles.
- ◆ Stationary Noise Level Measurement as per ISO 5130 : 1982(E), IS 10399 : 1998 for all vehicles.
- ◆ Range Test for LPG / CNG fuelled vehicles as per AIS : 055.
- ◆ Vehicle Weighment for all vehicles as per IS 11825 : 1986.
- ◆ External projections on Motor Vehicle as per IS 13942 : 1994, AIS : 120, ECE R26-03, ECE R61, 74 / 483 / EEC.
- ◆ Safety Checks for LPG/CNG fuelled vehicles as per AIS : 026, AIS : 027 and AIS : 028.
- ◆ Verification of arrangement for operation of Foot Controls for M category as per AIS : 035.
- ◆ Requirement of Temporary Cabin for Drive Away Chassis for N category vehicles as per AIS : 070.
- ◆ Measurement of Approach, Departure and Ramp Angles of Automotive Vehicles (G Category) as per IS 12218 : 1987 & AIS : 053.
- ◆ Acceleration performance of 2 wheeler as per IS 10407 : 1998
- ◆ Acceleration performance of automotive vehicles other than 2 and 3 wheelers as per IS 11851 : 1986.
- ◆ Fuel efficiency test (Highway fuel consumption & City fuel consumption).
- ◆ Manoeuvrability on Serpentine Course.
- ◆ Automotive Trailer testing as per AIS : 113 – Trailer code.
- ◆ Requirement of Spark Arrester devices as per Petroleum Rule 2002 Chapter 10.
- ◆ Evaluation / Verification of Buses as per AIS : 052, AIS : 153.
- ◆ Evaluation / Verification of Trucks as per AIS : 093.
- ◆ Evaluation / Verification of Ambulances as per AIS : 125.
- ◆ Evaluation / Verification of School Buses as per AIS : 063.
- ◆ Evaluation / Verification of Sleeper Coaches as per AIS : 119.
- ◆ Evaluation / Verification of Double Decker Buses as per AIS : 139.
- ◆ Statutory requirements for Vehicle Identification Number as per AIS : 065.
- ◆ Automotive Vehicles – Use of Run Flat Tyres, Temporary Spare Wheels and TPMS system as per AIS : 110, TPMS as per AIS : 154.
- ◆ CMVR type approval of retro fitment of Hybrid Electric System as per AIS : 123.
- ◆ Tell Tale Symbols Checks for M, N, L and CEV category of as per AIS : 071-2009 and AIS : 126.
- ◆ Cooling Performance Trials as per IS 14557 : 1998.
- ◆ Safety requirements of Hydrogen Powered vehicles for M&N

Outdoor Vehicle Dynamics Trials on Various Test Tracks :

VEL executes all Vehicle Dynamics Trials related with CMVR and Vehicle Development Trials at various test tracks available in the country, namely the following :

- ◆ NCAT, Ahmednagar, Maharashtra
- ◆ GARC, Chennai, Tamilnadu
- ◆ WABCO, Chennai, Tamilnadu
- ◆ NATRAX, Pithampur, Madhya Pradesh
- ◆ Any other Accredited Test Track meeting test standards

Dedicated office and operational space is made available at the outdoor locations indicated above to support vehicle preparation and smooth operations. VEL is carrying out CMVR Type approval trials at the above said locations for all type and categories of vehicles. All the above locations are well equipped and supported with the requisite test instrumentation facility and technical manpower.

New Capabilities & Services on Vehicle Dynamics Assessment :

- ◆ Trials to understand engine performance with various fuel mapping.
- ◆ Testing techniques to understand influence of accelerator pedal ratio in engine mapping.
- ◆ Engine performance with various CAN parameters of vehicle for better understanding.
- ◆ Engine rpm, temperature, pressure logging at 500 Hz for better analyzing.
- ◆ Fuel efficiency trials (fuel consumed for distance traveled with fuel flow meter).
- ◆ Engine performance considering the Air conditioning system (AC-ON, AC-OFF, Accelerator pedal cut off).
- ◆ Maximum speed trials to obtain the maximum possible speed on the powertrain unit.
- ◆ Developmental coast down test to understand the influence of weight of the vehicle, wheel drag, ambient conditions and number of sets.
- ◆ Wheel Drag Measurement for optimized values during coast down test.
- ◆ ABS performance trials on various surface co-efficient of adhesion, μ (0.1, 0.3)
- ◆ Green brake performance.
- ◆ Instrumentation of line pressure for each wheel, temperature mapping on brake pads / liners.
- ◆ Vacuum booster performance analysis (Hill terrain).
- ◆ Failure conditions (line pressure, ABS etc).
- ◆ Fade and thermal mapping of brake pads / liners.
- ◆ Wet braking conditions on brake pads / liners.
- ◆ Clutch related test such as engagement point, disengagement point, clutch travel on gradeability etc.

Electronic Stability Control (ESC) Systems Evaluation :

VEL has pro-actively geared up for handling future technologies viz. Electronic Stability Control (ESC), For M1 and N1 category vehicles as per AIS : 133 and UNECE Regulation No. 140. Double lane change tests, Lane Departure Warning System (LDWS) and Advanced Emergency Braking Systems (AEBS) and other developmental trials on passenger cars and trucks. Test facility requirements are addressed and updated continuously based on importance and usage. The following high precision instruments are employed for carrying out tests to meet the requirement of the standards.

- ◆ Steering Robot (ABD SR60 Torus)
- ◆ GPS Based Data Acquisition System (Race logic VBOX)
- ◆ Foot Pedal Brake Force Meter
- ◆ Inertial Measurement Unit
- ◆ Outriggers
- ◆ Weather station
- ◆ Riding gears and safety gadgets necessary for the tests

The evaluation of Electronic Stability Program (ESP), as per AIS 150 and UNECE Regulation No. 13. for M2, M3 and all N category vehicles are carried out at VEL, by preparing vehicles with safety cages and outriggers.



Vehicle fitted with outrigger



Vehicle instrumented with Steering Robot



Tractor fitted with cage & outriggers



Tractor-Trailer with cage & outriggers

Services offered for Tyre Industry :

Competency for testing and approval of C1, C2 & C3 Class of Pneumatic tyres in the field of rolling sound emissions & adhesion on wet surfaces as per National and international regulations e.g. AIS 142, UN ECE R 117, INMETRO standards.

single point service support for international certification

- ◆ TUV Certified test track.
- ◆ Standard vehicles.
- ◆ Calibrated Instrumentation.
- ◆ SRTT and Controlled tyres with cold storage facility as per ASTM F 2498-18.
- ◆ Support facilities at the workshop including tyre changing facility.
- ◆ Possess fleet of vehicles & wheel rims to cover tyre sizes from 12" upto 22"



Tyre Wet Grip



Tyre Noise Test

Services offered for CEV Industry :

VEL offers on site services to the Construction Equipment Vehicle (CEV) Industry for various safety provisions which are notified under CMVR as per G.S.R 673 (E) dt. 27.10.2020 and as per AIS:160-Part-1. VEL is well equipped with sound power measurement system using noise test field which is widely used to measure emission of Sound Pressure levels at operator's position, Sound Power Levels in Earth-Moving Machinery in Static and Dynamic conditions as per ISO 639-3, ISO 639-4, ISO639-5, ISO 639-6 standard.



CEV



CEV

Test Track Accreditation Services :

- ◆ Accreditation of Test Tracks, as per specific requirements of test standards.



Services offered for Agricultural Tractor Industry :

VEL offers on site services to the Agricultural Tractor Industry for assessment of various safety and environmental provisions which are notified under CMVR .

- ◆ Brake Test (IS: 12061 - 1994 & IS: 12207 - 1999) as per Rule no. 96 (C) - Dynamic Test, Cold Test, Hot Test and Parking Brake test.
- ◆ Turning Circle Diameter test (IS:11859-1986) with Brake Application as per Rule no. 98 (A) (2) and Turning Clearance Circle Diameter.
- ◆ Turning Circle Diameter (IS:11859-1986) without Brake Application as per Rule no. 98 (A) (2) and Turning Clearance Circle Diameter.
- ◆ Steering Effort Test (AIS : 042) as per Rule no 98 (A) (3).
- ◆ Noise Level Measurement as per Rule no. 120 (3) - Operator's Ear Level Position Noise Level (AIS : 115 (Part 1)) and By Standard's Position Noise Level (AIS : 115 (Part 2)).
- ◆ Maximum Speed Test (AIS : 116-2009).
- ◆ Weight Measurement (IS : 11825-1986).
- ◆ Identification of Controls, Tell-Tales and Indicators as per AIS:071 (Part 1).
- ◆ Control, Location and Operation Requirements as per AIS:071 (Part 2).
- ◆ Requirements of Ballast Mass for Agricultural Tractors as per AIS:105.



Services offered for EV Industry :

- ◆ VEL supports evaluation of all types of EVs (2W, 3W & 4W) as per CMVR Rules 1989.
- ◆ Electrical vehicles specifically emphasized on Regenerative Braking System, Gradeability, Flood Test, Pass by Noise Test.
- ◆ VEL also performs on road range testing for EVs on Mixed routes.



2 Wheeler - EV



3 Wheeler - EV

Heavy-duty fuel efficiency (HDFE) norms for commercial vehicles

- ◆ Government of India has issued notification for Truck & Bus categories of vehicle through Ministry of Power
- ◆ Evaluation of fuel economy using Constant Speed Fuel consumption (CSFC) test
- ◆ Fuel consumption (km/l) is being determined at constant speeds of 40km/h & 60km/h with vehicle in fully laden condition
- ◆ CSFC Test is carried out for all combinations of Tyres, Drivetrain which produces higher fuel consumption as per worst case criteria



ADAS Evaluation Services by VEL:

ARAI is equipped with advanced setup for simulating various ADAS test scenarios and precise data acquisition.

Surrogate Soft Targets complying respective ISO 19206 standards & Euro NCAP 2020 approved.

- ◆ Global VehicleTarget (GVT).
- ◆ Adult & Child Bicyclist Targets.
- ◆ Motorcyclist Target
- ◆ Articulated Adult & Child Pedestrian Targets.
- ◆ Remotely controllable Robotic Motion Platforms for Soft Targets.
- ◆ Driving Robots capable to control Steering wheel, Accelerator pedal, Brake pedal, Clutch pedal & Gear shifter simultaneously.
- ◆ Data Loggers, Controllers & Software capable to connect test vehicle driving robots & soft targets mounted on motion platforms remotely and simulate customized test scenarios to acquire necessary test data.



- ◆ Audio Visual Detection system for monitoring alarms & Tell tales during test scenarios.

VEL offers testing / certification services for following ADAS regulations:

- ◆ Forward Collision Warning (FCW) & Advance Emergency Braking Systems (AEBS) as per Draft AIS-162 / UN ECE R 131 for M2, M3, N2 & N3 category vehicles.
- ◆ Forward Collision Warning (FCW) & Advance Emergency Braking Systems (AEBS) as per Draft AIS-185 / UN ECE R 152 for M1 & N1 category vehicles.
- ◆ Lane Departure Warning Systems (LDWS) as per Draft AIS 188 / UN ECE R 130 for M2, M3, N2 & N3 category vehicles.
- ◆ Emergency lane keeping system (ELKS) as per Draft AIS 191 (Part 1) / (EU) 2021/646 for M1 category vehicles.
- ◆ Automated command steering function (ACSF) as per Draft AIS 193 / UN ECE R 79 for M & N category vehicles.
- ◆ Driver drowsiness and attention warning system (DDAWS) as per AIS 184 / (EU) 2021/1341 for M & N category vehicles.

Bus Body Builder Facility Accreditation Services :

ARAI has been authorized by the Ministry of Road Transport & Highways (MoRTH), for undertaking Accreditation of Bus Body Builders, across the country, in accordance with the notified procedures by MoRTH (No. S.O. 425 (E) dated 23rd March 2007 and S.O. 2356 (E) dated 3rd October 2012). ARAI issues Extension of Accreditation Certificate after the expiry of the validity of the Certificates every 3 years, either subject to physical audit or desktop audit.



Bus Body Builder Facility Accreditation

Recently Introduced Services :

- ◆ Noise measurement as per ISO 6394-2008.
- ◆ Safety Measures for Occupants of Three Wheeled Vehicles as per AIS : 134.
- ◆ Footrests for Two-wheeled Motor Vehicles as per AIS : 148.
- ◆ Certification of Motor Caravans as per AIS : 124.
- ◆ Electronic Stability Control (ESC) for M1 & N1 category as per AIS : 133.
- ◆ Brake Assist System for M1 & N1 Categories as per AIS : 152.

Capability and Facility Addition :

- ♦ Pass by Noise Testing as per IS 3028: 2018. UN R 41 & UN R51.
- ♦ VEL has pro-actively geared up for handling for future technologies viz. Brakes Assist System (BAS) for M1 and N1 category vehicles as per AIS 152 and UN R 139.

Vehicle Validation Trials :

- ♦ Validation Trials or Endurance Running of vehicles are undertaken for performance assessment vis-a-vis Indian load, road & climatic conditions.
- ♦ Test routes encompass high altitude, monsoon, high temperature regions, ghat sections, cross country, city and express ways.
- ♦ Validation trials have been undertaken for several overseas reputed customers covering a cumulative running of 20,00,000 kms.



Export Homologation Services :

VEL caters to export Homologation requirements for International Standards such as UN regulations, FMVSS, ADR, SANS, SABS, GSO, SASO, JASO etc.



Enhanced Capability for Sponsored / Research Projects :

- ♦ Benchmarking Exercises.
- ♦ Development trials for product development and roadworthiness.
- ♦ Assessment of Special Purpose Vehicles.
- ♦ Vehicle Validation Projects.
- ♦ Performance evaluation on road durability of four wheelers with mixed pattern of roads, (city+highway+Rough).
- ♦ Developmental projects towards ADAS.
- ♦ Performance and Durability of Engine oil and its effect on powertrain components for overseas Tier 1 client.
- ♦ Data Acquisition of Indian road, traffic, environmental and topographical conditions towards building an AI (Artificial Intelligence) for ADAS (Automated Drive Assist System) for mutually agreed travel distances, across Indian Territory.
- ♦ Dynamic, Static and Bench Performance Evaluation for complete Vehicle Development.
- ♦ Evaluation of correctness of speed measured with High Speed Camera Surveillance System, being deployed on roads for Traffic Management & Enforcement, up to 200 km/h.
- ♦ Fuel and oil studies on vehicles / Engines with running in (city+highway+Rough roads) and collection of Oil samples at different intervals and rating of components
- ♦ Performance assessment of various fuel and their characteristics on fleet operations by various Transport Corporations.
- ♦ Determination of Centre of Gravity for 2 Wheelers / 3 Wheelers
- ♦ Determination of static tilt angle of non automotive machines with attachments using Tilt Platform Facility
- ♦ Evaluation of Trucks including Hazardous Goods carrying vehicles such as petroleum tankers etc., as per AIS:094.
- ♦ Articulation test of Mine Proof Vehicle as per requirements of Ministry of Defence.

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The Automotive Research Association of India
(Affiliated to Ministry of Heavy Industries, Govt. of India)

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