

National Automotive Testing and R&D Infrastructure Project (NATRiP)

The National Automotive Testing and R&D Infrastructure Project (NATRiP) is the largest and one of the most significant initiatives in the automotive industry in India, representing a unique collaboration between the Government of India, a number of State Governments, and the Indian Automotive Industry. NATRiP is responsible for a new state-of-the-art testing, validation, and R&D project created to support the rapidly growing automotive industry in India.

NATRiP selected ETS-Lindgren, a world leader in the design and installation of automotive EMC test chambers, to provide this one of a kind test facility. With numerous automotive EMC test chambers provided to notable companies such as General Motors (GM), Ford Motor Company, Honda, and Chrysler, to name just a few of its prominent automotive customers, ETS-Lindgren's proven expertise encouraged a successful partnership. In addition, ETS-Lindgren assured NATRiP of excellent customer support with its active presence in Asia, including the establishment of ETS-Lindgren India - a new company with an office opening January 2009 in Bangalore.

The NATRiP project includes two major automotive EMC test facilities, one located in the city of Chennai and one located in the city of Manesar. Both facilities have one large 10 m chamber for full vehicle testing with an 11m diameter

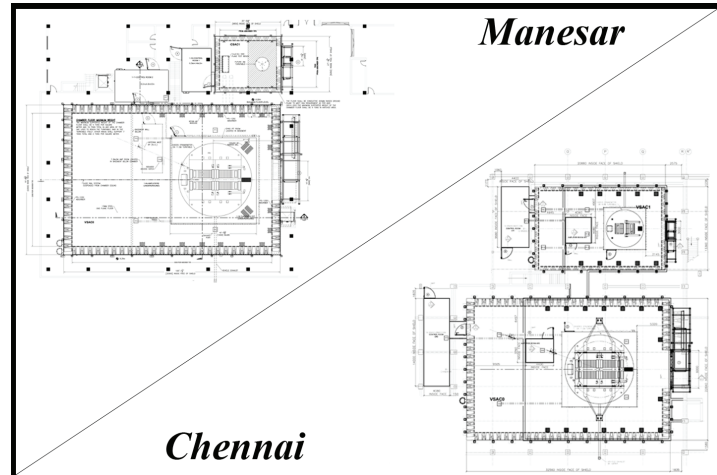
chassis dynamometer turntable for testing of large and small vehicles. The Chennai facility also has a smaller EMC test chamber with a 6 m diameter chassis dynamometer turntable for testing motorcycles, three wheeled vehicles and automotive components. Each site also includes several smaller control chambers and amplifier rooms for system measurement equipment.

Chambers Overview

GARC (Chennai)

This facility houses six chambers with the following dimensions (shown as length x width x height):

- Whole Vehicle Semi-Anechoic 10 m Chamber
-- 30 m x 20 m x 10 m
- Whole Vehicle Control Room
-- 10 m x 6 m x 3 m
- Two/Three Wheeler Semi-Anechoic Chamber
-- 19 m x 12 m x 8 m
- Two/Three Wheeler Control Room 10 m x 4 m x 3 m



- Amplifier Rooms
-- 2 rooms, each 4 m x 4 m x 3 m

iCAT (Manesar)

This facility houses five chambers with the following dimensions (shown as length x width x height):

- Whole Vehicle Semi-Anechoic 10 m Chamber
-- 30 m x 20 m x 10 m
- Whole Vehicle Control Room
-- 8 m x 4 m x 3 m
- Component Semi-Anechoic Chamber
-- 8 m x 7 m x 6 m
- Component Control Room
-- 6 m x 4 m x 3 m
- Amplifier Room
-- 7 m x 3 m x 3 m

RF Shielded Chassis Dynamometer Pit Rooms

An RF shielded dynamometer pit room is located underground in each facility basement below the

ten-meter chamber. The rooms are lined (floor and walls) with welded steel. Unique features of the dynamometer pit rooms include:

Full Vehicle Chassis Dynamometer System

Large four wheel full vehicle chassis dynamometer turntable in each ten-meter chamber capable of a maximum axle load in the track area of 9,000 kg; maximum turntable load is 19,000 kg total. Accommodates the complete mechanical chassis dynamometer configuration in solid welded steel construction, including a vehicle restraint system and a manual, removable centering device that enables quick positioning of the vehicle on the center of the roller.

Vehicle Cooling System

- Includes two chillers installed on a rack in opposite corners of the chassis dynamometer pit room. Each cooler has a capacity of 25 kw (total 50 kw) and is equipped with a fan to circulate the cool air in the pit.

Vehicle Exhaust Extracting System

- Includes an exhaust extraction pipe mounted below the covering made of galvanized steel and flexible pipes.
- Two flexible exhaust hoses (2 m long) connect the tailpipes of the vehicle to the inlet of the exhaust pipe made of electrically neutral material.

Entire Facility Technical Features

- Capable of performing EMC tests on vehicles from two wheelers up to Heavy Commercial Vehicles (HCV) as required.
- Constructed of ETS-Lindgren Series 101[™] pan-shield type light-

weight, modular shielding panels.

- Absorber treatment includes ETS-Lindgren PS-1250 and PS-600 FerroSorb[™] hybrid polystyrene EMC absorber material capable of handling a field strength of 200 V/m continuous in the entire frequency band and 600 V/m from 1.2 to 1.4 GHz and from 2.7 to 3.1 GHz. ETS-Lindgren's computer modeling expertise was utilized to select the optimal absorber for the desired performance and chamber size.

- ETS-Lindgren (Euroshield style) automatic sliding doors for EUT access and semi-automatic swing-type doors for personnel access to the chambers, control rooms and amplifier rooms. The fully automatic sliding door is designed to meet the highest shielding requirements with push button entry/egress.

- CCTV and intercom systems include ETS-Lindgren Model 4340 Digital CCTV color system. A direct digital feed (does not need PAL specification) allows the viewing of many cameras on a single PC. Features pan/tilt, focus, zoom, and fiber optic interface for control and video signals. EMI shielded to 200 V/m; standard operating frequency is from DC to 18 GHz.

- Fire detection includes a Very Early Smoke Detection and Alarm (VESDA) system with aspirating smoke detectors in all chambers.

- Accessories provided include RF filters, connector panels and lighting.

Compliance and Test Standards

The chambers meet the most restrictive conditions of the latest version of the following standards:

- Indian Automotive Industry Standard AIS - 004/1999
- MIL-STD-461E
- SAE J1113-22, SAE J1113-25
- CISPR 25, CISPR12
- SAE J551-11, SAE J551-12
- SAE J551-17, SAE J551-15

In addition, the chambers meet the applicable ISO automotive EMC standards as well as the OEM standards of Ford, GM, PSA (Peugeot - Citroën), BMW, Fiat, Chrysler, Honda, Mitsubishi and Mercedes-Benz.

About ETS-Lindgren

ETS-Lindgren is an international manufacturer of components and systems that measure, shield, and control electromagnetic and acoustic energy. The company's products are used for electromagnetic compatibility (EMC), microwave, wireless, and magnetic resonance imaging (MRI) testing, electromagnetic field (EMF) measurement, radio frequency (RF) personal safety monitoring, and control of acoustic environments.

Headquartered in Cedar Park, Texas, ETS-Lindgren has manufacturing facilities in North America, Europe and Asia. The company is a wholly owned subsidiary of ESCO Technologies, a leading supplier of engineered products for growing industrial and commercial markets. ESCO is a New York Stock Exchange listed company (symbol ESE) with headquarters in St. Louis, Missouri. Additional information about ETS-Lindgren is available at www.ets-lindgren.com. Additional information about ESCO and its subsidiaries is available at www.escotechnologies.com.