

Focus on CSIR research in Transport Infrastructure Engineering

World-class, cost-effective solutions for optimising your transport infrastructure

The Transport Infrastructure Engineering research group forms part of the Infrastructure Engineering competence area of CSIR Built Environment. It is a renowned research, development and implementing agency in the road engineering field with over 50 years of experience.

Aim

The Transport Infrastructure Engineering Research Group strives to effectively and efficiently deliver practical, innovative, knowledge-based solutions addressing the infrastructure needs of the transport sector. The group plays a leading role in the development, application and transfer of processes and technologies for the design, construction, maintenance and management of transport infrastructure. Its aim is to ensure that anyone can access the CSIR's advanced skills to strengthen their capabilities.

The group consists of a team of professionals specialising in all aspects of transport infrastructure design, construction, maintenance and rehabilitation, including the assessment of materials and pavement behaviour, and performance modelling. The senior engineers and technologists in the team have international standing and are well-known in their areas of specialisation through their contributions to the advancement of transport infrastructure engineering.

Experience

The group has worked in the Middle East, Europe, North America, Australasia and Asia, but its roots and primary expertise are in Africa. The CSIR's knowledge of the region is unsurpassed, and its services can be used to identify and solve the problems of clients.

The CSIR's background is research and development, and the organisation has specialized tools and facilities at its disposal to complement its efforts, as well as those of consultants with whom it is working.

Prime among these is the Heavy Vehicle Simulator (HVS), the most advanced Accelerated Pavement Testing (APT) device in the world. The CSIR's 30 years of unique APT experience has been gained in close cooperation with, and support from, the major road authorities in South Africa, the private sector and academia, through a partnered management approach. The technology has been exported internationally, to the extent that six HVSs are now operating outside South Africa. India and China have also ordered HVSs to support their technology development programmes.

Another CSIR innovation is the stress-in-motion (SIM) system that is able to measure tyre/road interface stresses under moving wheel loads. It measures simultaneously the vertical, transverse and longitudinal interface stresses. This information is one of the most important inputs into pavement design systems, and is also of great interest to tyre manufacturers.



The Advanced Materials Testing Laboratories associated with the Infrastructure Engineering Group have, throughout their history, played a vital role in shaping the South African transport infrastructure industry, and have been a significant contributor in establishing South Africa as a world leader in pavement engineering. Their activities have supported the development of guidelines and specifications (i.e. TRH, UTG, TMH and other industry guidelines such as the Sabita and Asphalt Academy Manuals), and assisted producers and contractors in the development and/or optimisation of new road products. In addition to the above, the Advanced Materials Testing Laboratories have also fulfilled the important function of operating as an independent reference laboratory and/or forensic laboratory for the local and international road construction industry.

The Product Development Centre converts innovative ideas into products and solutions. The Centre is supported by fully-equipped mechanical workshops, as well as electronic and IT specialists. It is geared to manufacture APT-associated equipment, surveillance equipment and laboratory and field-testing equipment.

The CSIR's advanced instrumentation, leading-edge analytical capability and in-depth knowledge of road behaviour and performance, enable the organisation to solve a wide range of road problems. As an intrinsic part of its research and development heritage, the CSIR can also impart this knowledge through technology transfer and training courses customized for the needs of specific clients, in association with the Technology Transfer Centre and the Asphalt Academy.

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Key competencies and services

• Pavement design

Structural analysis, modelling and design of flexible and rigid pavements.

• Vehicle/infrastructure interaction and full-scale assessment

Characterising and modelling of vehicle loading and the full-scale assessment of the behaviour and performance of infrastructure systems (rail, runways and roads) subjected to these loads.

• Materials design and optimisation

Development of procedures, test methods and specifications to optimise material properties such as bearing strength, flexibility, durability, etc.

• Construction and maintenance of infrastructure assets

Developing special purpose construction techniques and appropriate construction specifications for the construction and maintenance of transport infrastructure, and the transfer of best practice to industry.

• Material sourcing and management

Identification and management of natural and alternative material sources and the management of hazards associated with massive earth structures.

• Infrastructure management

Developing conceptual pavement management systems and decision support systems, including the development of road-specific key performance indicators.

Products

Pavement analysis & design software (pads)

- me PADS : mechanistic-empirical layered elastic pavement structural design
- fe PADS : mechanistic-empirical layered finite element structural design

- traf PADS : pavement structural design using realistic load characteristics
- back PADS : back-calculation of layer moduli from deflection measurements
- thermal PADS : asphalt pavement temperature prediction
- winDCP : analysis of Dynamic Cone Penetrometer measurements
- COMPACT : Volumetric design of road construction materials.

Heavy Vehicle Simulator (HVS) and associated instrumentation

- Heavy Vehicle Simulator (HVS)
- Multi-depth deflectometer (MDD)
- Crack activity meter
- Laser profilometer
- Road surface deflectometer (RSD).

Specialised road surveillance equipment

- Tyre/road contact stress-in-motion sensor (SIM)
- Linear displacement integrator (LDI)
- Dynamic cone penetrometer (DCP)
- Rapid compaction control device (RCCD).

Test equipment (field and laboratory products)

- Gravel roads test kit
- Twin-shaft pug mill laboratory mixer
- Durability Mill Index test apparatus
- Strain-at-break apparatus
- Erosion tester
- Bitumen-quality test kit
- Torsional recovery apparatus
- Average Least Dimension (ALD) equipment
- Wheel-tracking device
- Concrete cube press
- Nuclear gauge calibration blocks.