

APT Associated Research Needs

**APT Steering Committee
April 2005**

Background to RIRAC

- Inception meeting held in August 2004
- Purpose is to provide advice on nature & scope of R&D activities in road infrastructure
- RIRAC is to provide:
 - Advice on R&D needs and priorities
 - Assistance with technology foresight studies
 - Advice on development of strategic plans & research portfolio plans for research programme
 - Assistance with project portfolio analysis
 - Comments on business plans developed by MANCO
 - Assistance with review of outcomes
 - Assistance with assessment of impact

Research Advisory Committee

Secretariat

Management Committee

Focus Area 1

Focus Area 2

Focus Area 3

Etc...

PMG 1

PMG 1

PMG 1

Project 1
Project 2
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Project 1
Project 2
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Project 1
Project 2
.....

Needs Determination Process

- **Broad areas of research needs defined at RIRAC meeting of January 2005**
- **Secretariat tasked to:**
 - **Unpack needs**
 - **Integrate with needs identified elsewhere**
 - **Prioritise research needs**
- **“Synthesis of road infrastructure research needs for South Africa” (February & March '05)**
- **Secretariat to prioritise research needs by end April '05**

Synthesis of Needs

- Introduction
- Infrastructure Engineering (137)
- Infrastructure Delivery (38)
- Environment (22)
- Planning & Operations (14)
- Policy, Economics & Decision Support (10)
- Resources (4)

Infrastructure Engineering (1)

- Traffic & Operational Environment (8 – A)
 - Traffic loading & contact stresses (4 – A)
 - Impact of climate (4 – B)
- Bound & Unbound Pavement Materials (58 – B)
 - Mix components & characterisation thereof (4 – C)
 - Thin bituminous surfacings (11 – B)
 - Hot-mix asphalt (7 – A)
 - Cold-mix asphalt (2 – C)
 - Cement concrete (5 – B)
 - Recycled materials (3 – A)
 - Lime & cement stabilised materials (3 – B)
 - Unbound materials (7 – B)
 - Gravel wearing courses (8 – B)
 - Innovation in materials (5 – C)
 - General (3 – C)

Infrastructure Engineering (2)

- Geometric design & Structural Design (33 – B)
 - Road design (11 – C)
 - Structural design & performance (18 – B)
 - Innovation in road design & structural design (4 – B)
- Road Furniture & Structures (22 – C)
 - Road furniture (4 – C)
 - Structures (13 – C)
 - Innovative approaches for preservation of assets & rapid renewal (5 – C)

Infrastructure Engineering (3)

- Management of Assets (15 – C)
 - Pavement surveillance (5 – B)
 - Asset management & uniformity in policies (6 – C)
 - Vehicle characterisation & vehicle overloading (4 – C)
- General (Stds & Specs; 1 – A)

APT-Associated Needs

- Cold in-place recycling
- Asphalt performance
- Provision of low-volume roads
- Vehicle-pavement interaction
- Concrete pavements

- Cross-cutting:
 - Appropriate surfacings
 - LTPP vs APT
 - Structural design
 - Non-destructive testing

Treated & untreated granular layers

- Refinement of FBT and ETB guidelines
- Standard specifications for CIPR
- Recycling/treatment with cement/lime
 - Resilient & plastic deformation models
 - Cement stabilisation study (Phase 2)
- Review of design models for G1-G4 materials
- Improved material characterisation methods (e.g. Texas Triaxial)
- Review of Codes of Practice (e.g. TRH14)

Asphalt performance

- Impact of contact stresses & temperature on behaviour & performance
- Mix design issues:
 - Spatial composition
 - Laboratory compaction methods
 - Test methods for permanent deformation & fatigue
 - Permeability and durability
 - Design of SMA
 - Improved reliability in predicting performance
- Validation of HMA design guidelines
- Revision of TRH8
- Standards and specifications

Concrete pavements

- **Calibration/refinement of CNCPave**
- **Performance-based concrete mix design**
- **Innovations in concrete technology (e.g. ultra-high strength concrete)**
- **Guidelines on the design and use of thin and ultra-thin concrete layers**
- **Integration of concrete pavements in TRH4 and the SAMEDM**

Appropriate surfacings

- **Cost-effective upgrading solutions for unpaved roads**
- **Performance-related strength requirements and minimum strength criteria for light pavements**
- **Adhesion and bonding of thin surfacings to their support layers**
- **Guidelines on the design and use of thin and ultra-thin asphalt and concrete**
- **Appropriate surfacings for intersections**
- **Cost-benefit of modified binders**
- **Revision of TRH3**

APT versus LTPP

- Influence of temperature and moisture variations on pavement design, analysis and management (APT versus LTPP)
- Calibration of structural design and performance models
- Innovative methods for the management and analysis of data from APT and LTPP studies
- Long-term performance data on seals

Structural design

- Revision and upgrade of ME design method
- Integration of all ME design methods
- Incorporation of input variables (e.g. materials/ traffic/climate variety and variability) in structural design theory
- Finite element engine for pavement analysis incorporating, amongst others, 3D distribution of tyre-pavement contact stresses and dynamic characteristics of real life pavement loading
- Long-life pavements
- Revision of TRH4 and TRH12

Non-destructive testing

- **Methods for the identification and characterisation of weak interlayers and poor bonding between upper layers of pavements**
- **Harmonisation of deflection measurement devices**
- **Guidelines on the appropriate use of GPR**
- **The use and application of seismic early crack detection**
- **High-speed, NDT procedures and automated systems for monitoring and controlling quality of road pavements**