

Asphalt Quality

Initiatives by Sabita



Framework

- Problem statement
- Quality chain
- Progress

Problem statement

2007

Reports on Gautrans Forensic Study

1. *HMA Forensic Investigation Part 2* – CSIR Built Environment Pretoria, October 2005
2. *Forensic Investigation into the performance of Hot-Mix Asphalt* – Denneman and Van Assen, Pretoria September 2006
3. *Performance of Hot-Mix Asphalt in Gauteng; A Forensic Investigation* – Denneman, Sadzik Pretoria 2007

Review by industry experts January 2007

1. Mix design procedures NOT harmonised with structural requirements
2. Mixes materialising on projects often did not correspond to the designs
 - inadequate quality assurance and control
 - deficiencies in multi-laboratory precision and accuracy.

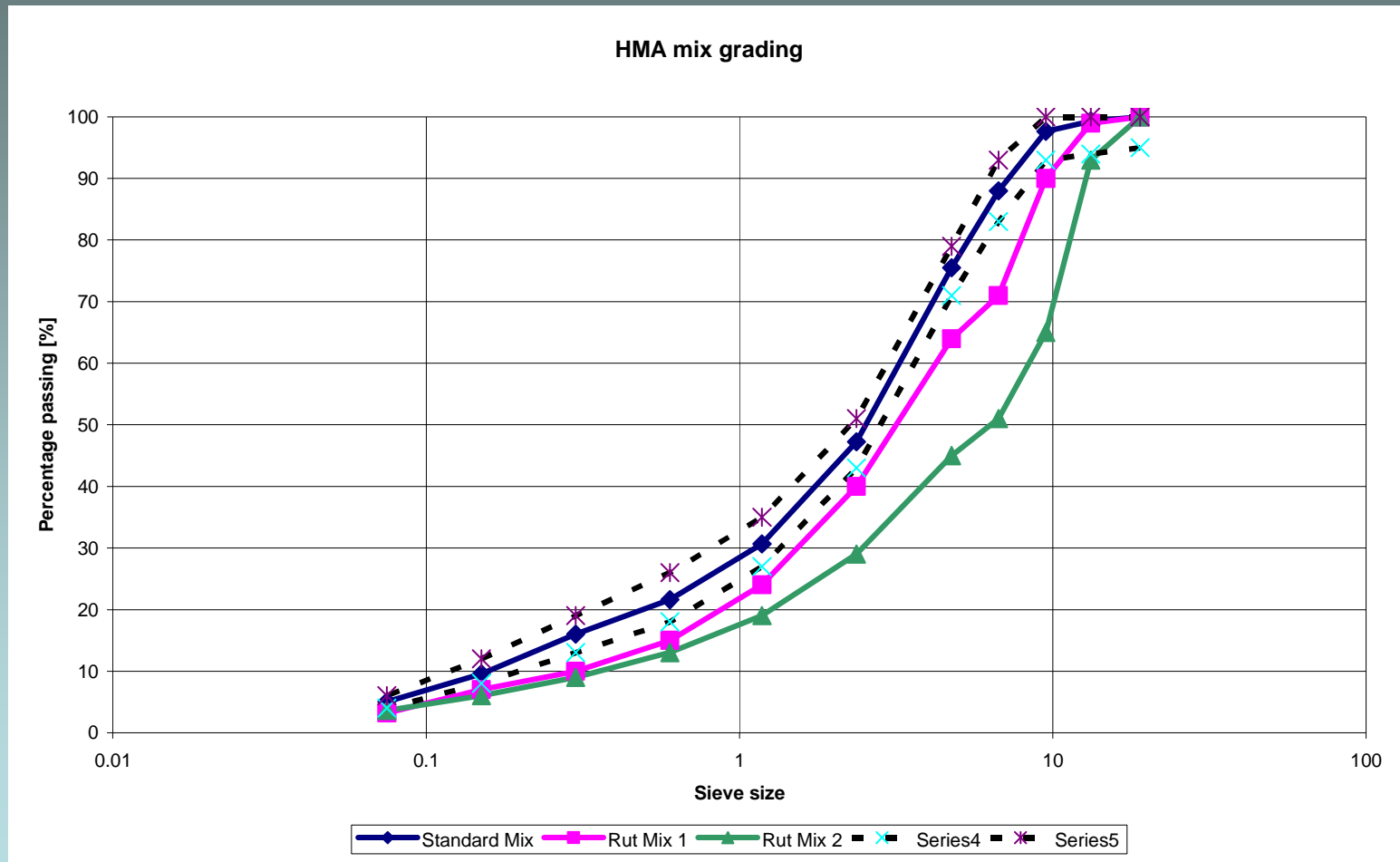
Conclusion

1. Not surprising - design lives of the sections studied - typically only 4 – 6 years (50% of the expected)
2. HMA design due for a serious overhaul:
 - Better understanding of **aggregate packing** (rather than adherence to obsolescent grading envelopes)
 - Relative roles of **aggregate interlock and binder rheology** to resist permanent deformation
 - Durability and resistance to **fatigue** distress not compromised in pursuance of resistance to **permanent deformation**

“Rut challenge”

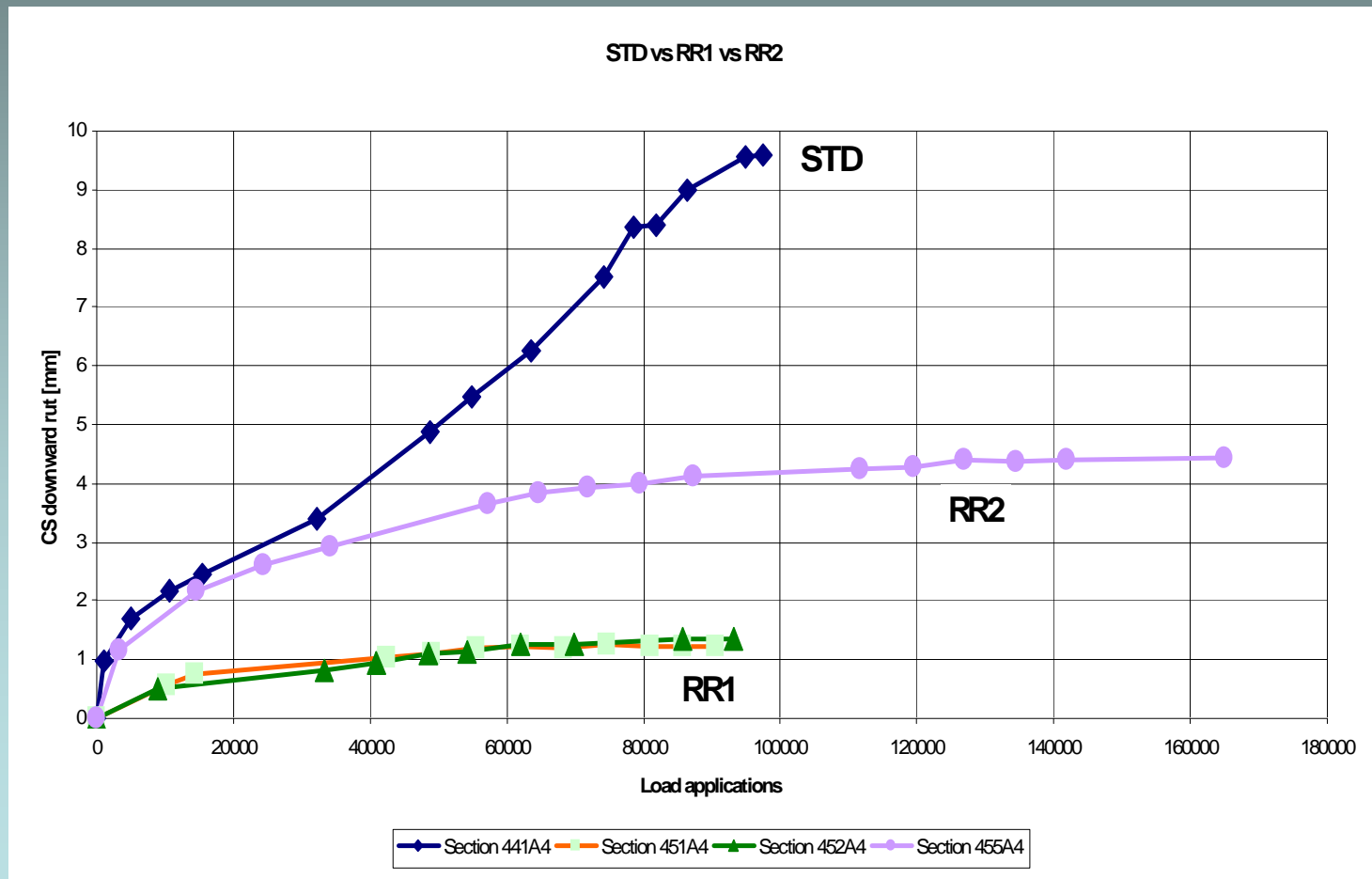
- GDPTRW & industry (Sabita) joint venture
- Part of a wider study
- Examine:
 - Optimal mixes to resist permanent deformation (compared to standard mix)
 - Laboratory methods to assess this quality

Comparative gradings

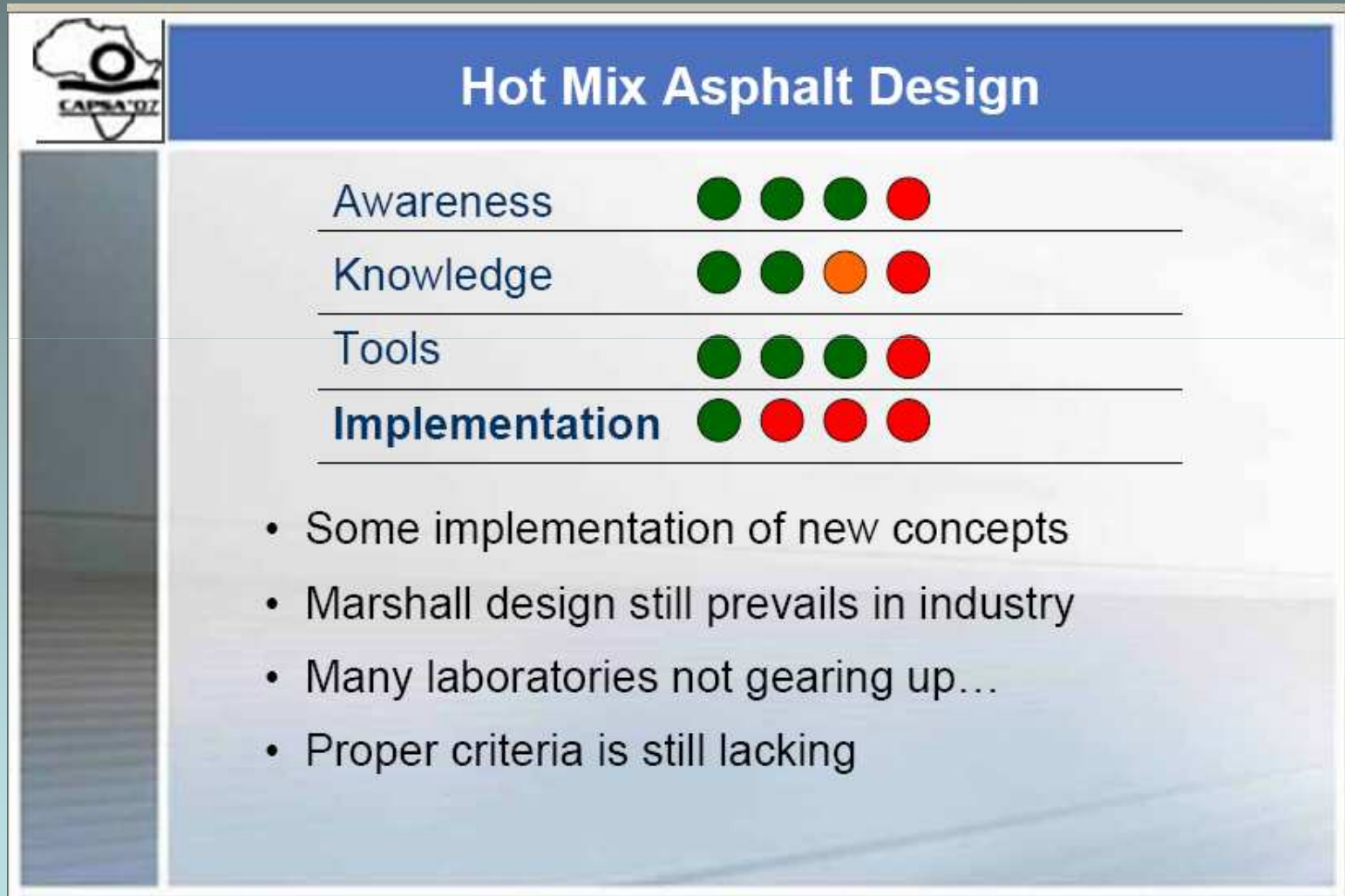


Performance under APT

STD vs RR1 vs RR2 - channelised



Closing remarks CAPSA 07



Closing remarks CAPSA 07



Variability and Risk: Quality Management

Awareness ● ● ● ●

Knowledge ● ● ● ●

Tools ● ● ● ●

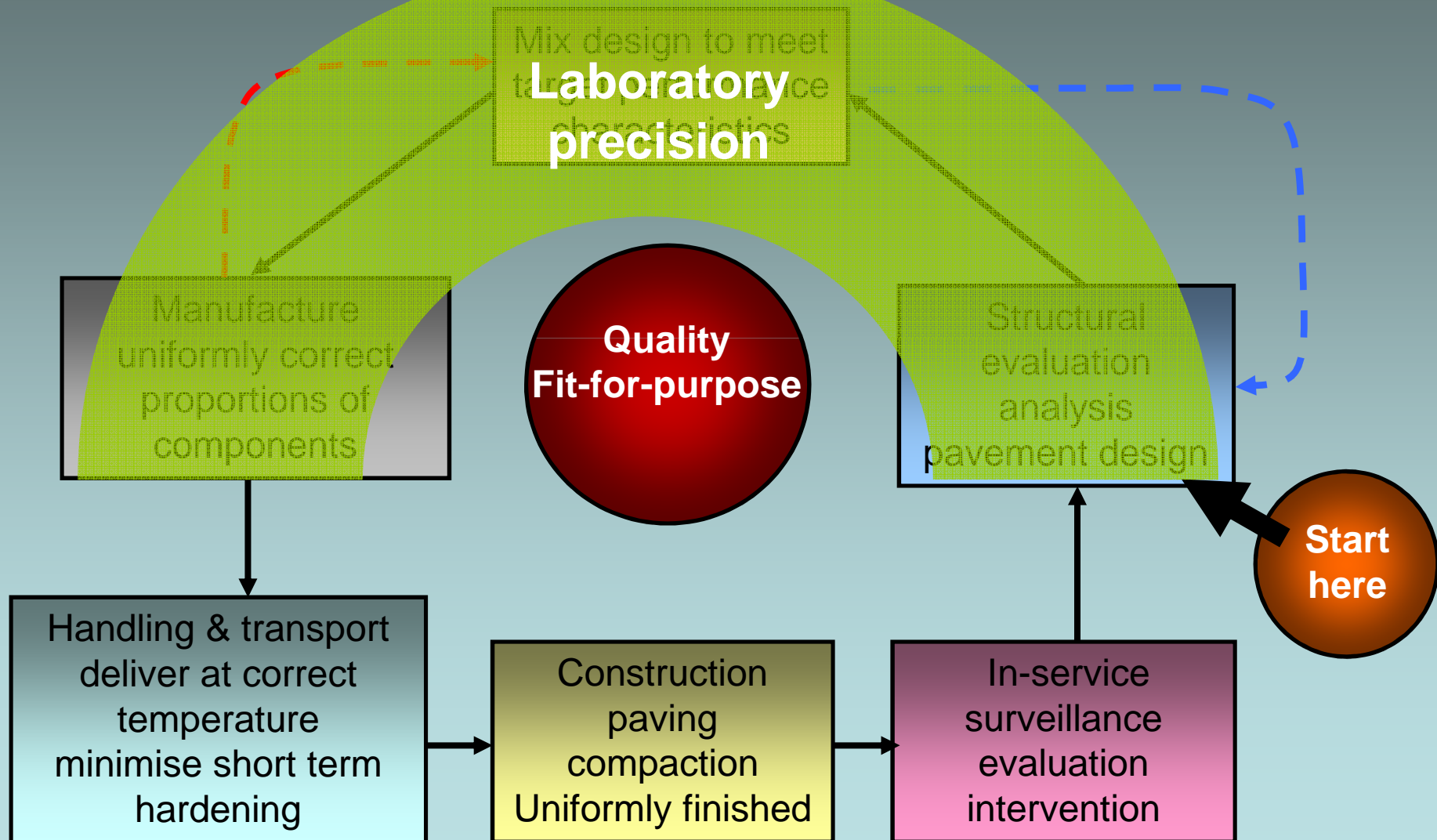
Implementation ● ● ● ●

- SANAS Accreditation
- Many old plant/equipment, inertia to change
- Reluctance to embrace performance contracts
- Laboratory proficiency schemes

Quality Chain

Framework for going forward

Asphalt quality chain loop



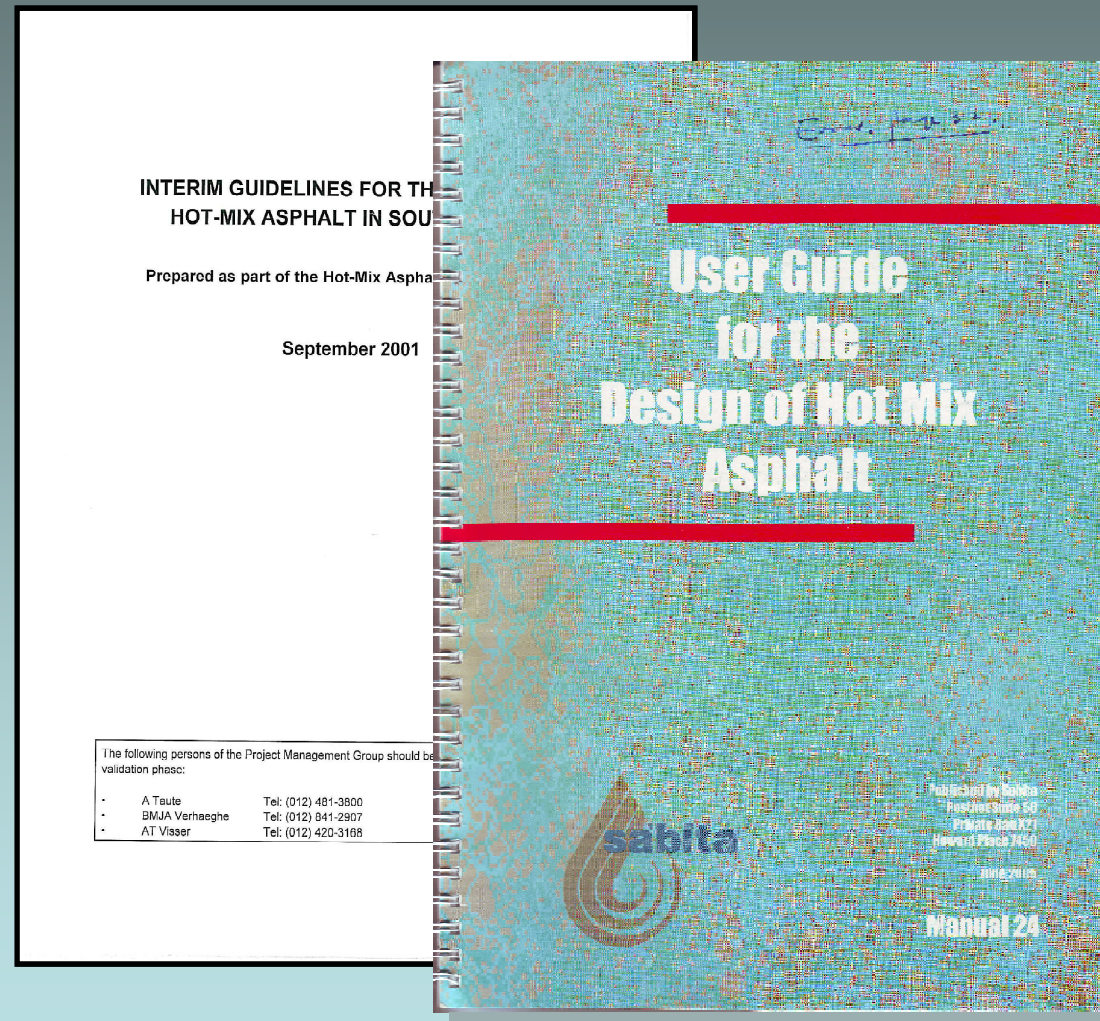
SAPDM objectives

- ***Characterising SA HMA to determine their mechanistic properties for future use in the SAPDM.***
 - *dynamic modulus*
 - *shear modulus*
 - *beam stiffness modulus*
 - *beam fatigue*
 - *permanent deformation characteristics.*
- The test results provide a base for the development of reliable resilient response and damage models for SAPDM.

Mix design issues

- Methods do not incorporate the effects of short and long term ageing
- Development simple tests to gauge complex response and damage characteristics
- Optimal aggregate packing and binder grades
- Boundary conditions between the use of conventional or modified binders
- Dated technology

Current best practice



General comment on manufacture and handling

- Quality management systems registered as complying with ISO 9001:2000
- National Highway Sector Schemes (UK)

ISO 9001:200

13 management/procedural functions covered

- management responsibility
- contract review
- design control
- document and data control
- product identification, control and traceability
- process control
- inspection and testing
- control of inspection, measuring and test equipment
- inspection and test status
- control of non-conforming products
- corrective and preventative action
- handling, storage, packaging, preservation and delivery
- control of quality records.

National Highways Sector Schemes (NHSS)

- **Scheme 14 – Production of asphalt**
- Developed with the support of UKAS
- **Complementary to and interprets ISO 9001:2000**
- Provide an industry benchmark
- Ensure that all processes are planned
- Provide a basis for continuous improvement
- **Focus on quality as an objective**
- **Reduce overall costs for the client and supplier**
- Provide and maintain a properly trained and competent workforce
- **Involve all sides of the industry in scheme ownership within a partnership framework**
- Ensure that Certification Bodies use auditors with technical knowledge and experience of the sector concerned
- Promote confidence in quality management systems by provision of a robust, transparent system.

Laboratory precision

- Overriding issue
- Laboratory result initiates a commercial transaction
- Practice largely poorly informed on subject of precision/uncertainty
- Debates and disputes not always well founded
- **SANAS accreditation ineffective without a national laboratory proficiency scheme**

Closing remarks CAPSA 07



Variability and Risk: Quality Management

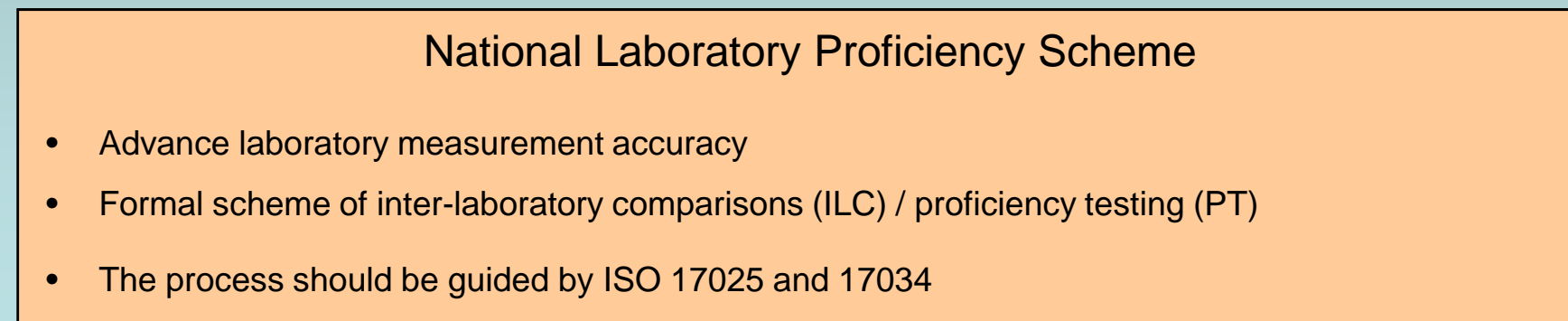
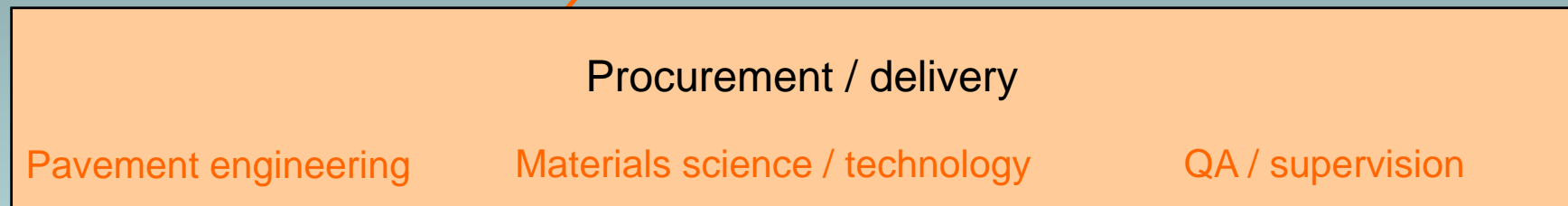
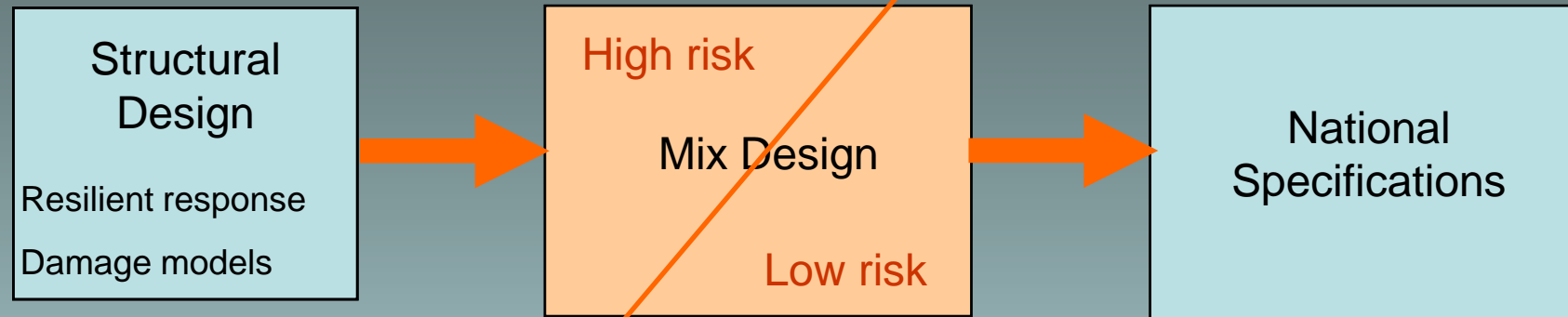
“...**up to 60% of all variability** measured during testing of certain properties can be **attributed to sampling and testing** ... problems and not to the materials and construction practices”

Taute et al CAPSA 2007

“...a **framework to improve laboratory proficiency** – a critical component of any laboratory accreditation scheme – **was sorely lacking** in the industry, and aggravated by a loss of experienced practitioners.

Rossmann et al CAPSA 2007

Project schematic



Progress to date



FRAMEWORK FOR THE DEVELOPMENT OF A QUALITY SYSTEM FOR PREMIXED ASPHALT

Goal

The ultimate aim is to develop a set of procedures that would ensure consistency in the manufacture and construction of asphalt that meets the performance characteristics implied in the structural design procedures currently being developed. Specific areas to be covered are:

- ? Development of a national specification that would ensure fit-for-purpose asphalt
- ? National mix design procedure consonant with specification targets
- ? Process control procedures from source material to finished product
- ? Expansion of the current SANAS accreditation system to incorporate a national laboratory proficiency scheme.

Scope

National specification

The current COLTO specification does not relate to the requirements of structural design parameters currently being developed to ensure optimal pavement performance. It was learnt that SANRAL intends to commence with the revision of the (COLTO) specifications beginning 2011, and they have the financial resources (R5million) to do so. While they would no doubt seek participation from the likes of Sabita, it seems that they require no tangible contributions to this project.

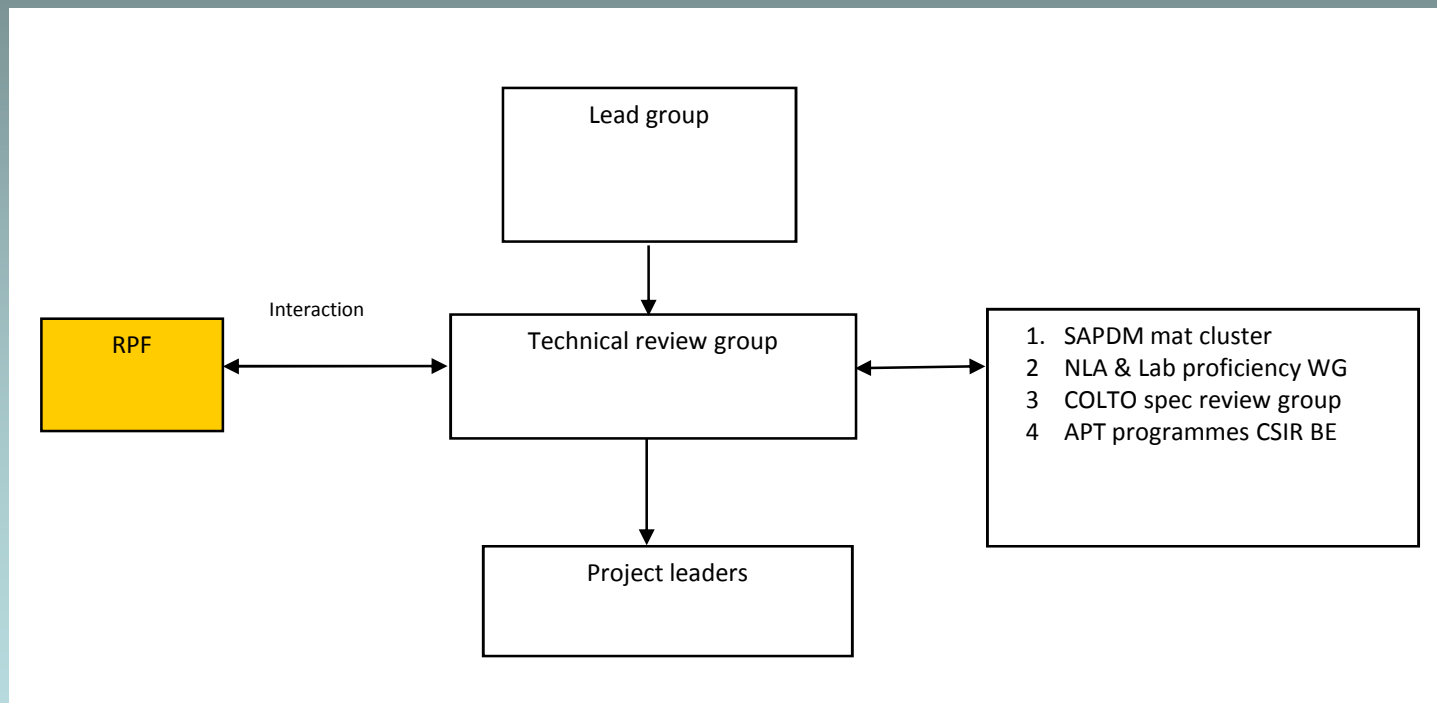
In order to add value to the outcomes of the revision of the national specification, SANRAL would like to see Sabita commencing on the process of developing a revised national procedure for the design of asphalt mixes. They feel that a (multi-reliability) design procedure would inform the process of developing a specification; by doing it this way round, the development of realistic, sound, performance based specifications would be facilitated covering a variety of applications (including municipal projects e.g. light traffic streets).

It seems appropriate that the revision of the design method, with due cognisance of outcomes of the SAPDM revision, should commence without delay. While the design of warm mix asphalt (WMA) would ultimately have to be addressed in the interests of sustainable practice, it would be prudent to focus, initially at any rate, on hotmix asphalt – a more familiar terrain.

National mix design procedure

The review of the national structural design procedure, national specification and a national mix design procedure will clearly impact on one another and it would seem that while the design procedure would be influenced substantially by outcomes in the development of the structural design procedure, the development of national specifications would be informed significantly by the design procedure. It is therefore essential that clear paths for interaction between these processes be established. In essence this means that the HMA design guidelines published in 2001 would require revision to harmonise it with amended

Process schematic



Key outputs

- National specifications
 - SANRAL intends to commence revision (2011)
 - Design procedure will inform formulation of specs
- Mix design procedure
 - 2001 method revised and aligned to SAPDM
 - Published as either TRH or Sabita manual
- Delivery mechanisms
 - Review of procurement procedures
 - Performance based specifications
 - Client owned stockpiles

Key outputs cont...

- Quality management
 - Process control
 - Underpin ISO 9001 with procedures like UK HSS
 - Control of binder hardening and segregation
 - Laboratory proficiency
 - In accordance with ISO17025 & 17034
 - Sabita task group (H Marais)

Hotmix Premixed asphalt

- Sustainable practice
 - Impetus gaining with WMA
 - Technical support for reclaimed asphalt
- Design procedure should accommodate:
 - Lower production temperatures
 - Use of significant proportions of RA
- Start with familiar terrain of hot mix
 - Link with RPF task group & WM interest group