CHAPTER 1

INTRODUCTION AND BACKGROUND

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Pavement design dates back to the early years of the twentieth century and, since then major advancements in the design methods have resulted in the development of an independent mechanistic pavement science. This science is advancing rapidly with the aid of computers and the introduction of full scale testing facilities worldwide today.

Major advancements in the layered theory of pavements have been made since its introduction in the early 1940s, and recently very sophisticated analytical or mechanistic methods exist for the design of new pavements, reconstruction of existing ones and strengthening overlays. Although these methods are theoretically sound, a gap still exists between actual pavement behaviour (practice) and theory.

During the late 1970s, the fleet of newer generation Heavy Vehicle Simulators (HVSs) was introduced in South Africa (Walker, 1985). These machines were developed to subject roads and airfields to accelerated trafficking in order to study their actual behaviour. One of these HVSs commissioned in 1977 belongs to the Tranvaal Provincial Administration (TPA) and has been operated by the Division of Roads and Transport Technology (RTT) on behalf of the TPA.

The initial test programme for the TPA HVS concentrated on the behaviour of light unbound gravel base pavements. Thereafter a major study on the behaviour of high quality crushed stone base pavements was undertaken and completed during 1982. From 1982/83 to 1988 a study on relatively light pavements with cementitious layers was done. A total of approximately 710 million equivalent standard (8200 kg or 80 kN) axle repetitions (E80s) has been applied to the pavements in the Transvaal to date, at a 1988/89 cost of approximately 1,26 cent per E80. Although this cost is relatively high, large savings has already resulted from this work (See last paragraph in this section, as well as Paragraph 4.5 in Chapter 4).

This dissertation reports on the study during the latter period of research (1985/88), and concentrate on the basic behavioural characteristics of pavements with lightly cementitious layers. More than 80 per cent of the pavements in the 46 000 km road network in

the Transvaal consists of cementitious base or subbase layers. If these are to be maintained effectively, or new improved pavement structures designed, it is essential that information regarding their general behaviour characteristics be obtained.

It is believed that this information will not only assist in bridging the gap between practice and theory, but will ensure the construction of better and more cost-effective pavements in the future. It is currently estimated by the TPA that implementation of the HVS research findings for the period 1978 to 1982, entailed an estimated annual saving of approximately R13 million in the Transvaal. The present annual pavement funding requirement for Transvaal is approximately R1000 million and, if the research discussed in this dissertation results in better use of normally underrated materials, further millions of rand may be saved.

1.2 REFERENCES

Walker, R N (1985). The South African Heavy Vehicle Simulator. Proceedings of the Annual Transportation Convention, (ATC 1985), Session S.350, Accelerated Testing of Pavements, 29 July - 2 August, CSIR, Pretoria, 1985.