CHAPTER 2

SCOPE AND OBJECTIVES OF STUDY

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2.1. Scope

During the early 1980s, it was established that urgent research was needed on the general structural behaviour of pavements with lightly cementitious layers. These layers consist of C3 and C4 (TRH 13, DRTT, 1986) materials, and the term "cementitious" is used, inter alia, with the term "cemented". (The term "cemented" may be misunderstood in that it reflects only materials stabilised with portland cement; "cementitious" is preferred because some of the aspects discussed here may be valid for materials stabilised with stabilisers other than cement, including lime, fly - ash, milled granulated blast furnace slag, bitumen emulsion etc).

This study follows an earlier study completed during 1985 (De Beer, 1985) on the same type of materials, but used as subbases under bituminous base pavement structures. This study, however, concentrates primarily on pavements with cementitious bases, designed to carry relatively light traffic, viz 0,4 to 1,0 million standard repetitions (E80s) over a design period of 20 years.

Major uncertainties existed regarding the real behaviour of these pavements, and included aspects such as definition of the actual pavement system, viz layer thickness and quality, distress modes and failure mechanisms, both long and short term durability, erodibility and design considerations. The scope of this study is to evaluate these factors with the aid of the HVS and other relevant tools such as the Dynamic Cone Penetrometer (DCP), Multi - Depth Deflectometer (MDD), Road Surface Deflectometer (RSD) and the linear elastic theory.

2.2 OBJECTIVES AND MOTIVATION

The layout of this study is illustrated in Figure 2.1, and each chapter including the appendixes, is indicated separately in the flow diagram. Each chapter is representative of a major area and conveys the most important findings following from the research. The detailed objectives and motivation for each chapter are discussed in its introduction and only the overall objectives are discussed here.

The overall objective of this study is to investigate and report on the structural behavioural characteristics of pavements with lightly cementitious layers in order to identify the most important factors controlling their behaviour and hence structural capacity.

To achieve the abovementioned overall objective this study consists of a number of sub - objectives, which are listed and discussed below.

These include:

(a) **The development of an in situ pavement classification system (Chapter 3).**

Experience with the HVS testing over the years indicated that it is of crucial importance to define the actual in situ pavement system correctly. Numerous examples exist where these conditions differ completely from that originally proposed during the design phase, and that the ultimate structural behaviour of these pavements, ie rutting, cracking, pumping etc. is controlled mainly by factors associated with these differences in pavement/material quality. For pavements with cementitious layers this is even more important and often critical because inefficient mixing of the stabiliser, detrimental carbonation, inadequate layer thickness, interlayers, horizontal cracking etc., contribute largely to and often control the structural capacity of these pavements. The actual failure mechanism is a function of the pavement structure, and therefore it is necessary to establish an objective method to describe and classify in situ pavements in addition to normal

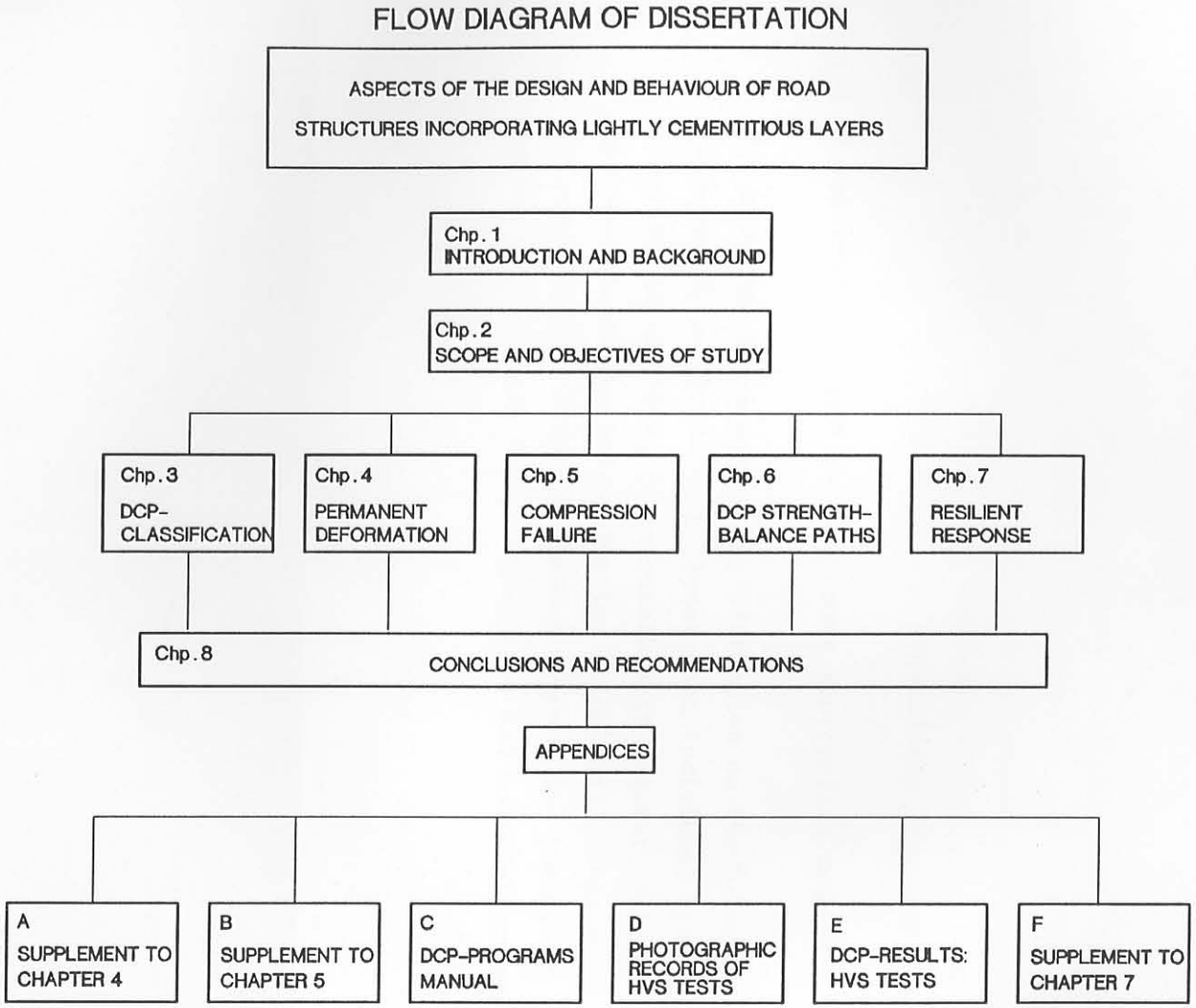

FIGURE 2.1

LAYOUT OF THIS DISSERTATION

design classification and grouping of pavements as is illustrated, for example in current design documents such as TRH 4 (TRH 4, DRTT, 1985). Furthermore this classification system may also assist in an improved understanding of pavement behaviour.

(b) **Evaluation of permanent deformation development (Chapter 4)**

Permanent deformation development as a result of traffic loading is one of the most fundamental characteristics of pavements which is studied to indicate and quantify its structural capacity.

(c) **Evaluation and description of actual failure mechanisms (Chapters 4, 5, 6, and 7).**

It is all very well to measure the deformation development and the effects of cracking on the surface of the pavement, but in order to understand the reasons for this behaviour fully it is necessary to investigate its origin and the state of layers/materials within the pavement system. Normally there is a "weakest link/layer" in the pavement which controls its behaviour and which has to be identified so that it can be isolated or be taken into account during the design phase for similar pavements in the future. Aspects addressed here are:

- Fatigue failure of cementitious layers
- Compression failure of cementitious layers
- Methods to describe pavement behaviour
- Resilient responses of the pavements
- Reference to erodibility (durability)

(d) **Development of additional and more appropriate design guidelines**

By using the HVS a wealth of information on the behaviour of a pavement is generated with almost each individual test. With this large amount of data, it is possible to generate better and more appropriate design and evaluation guidelines. This will lead to the improvement of current design methods and increased confidence in the use of local design, pavements and material systems.

2.2 REFERENCES

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Division of Roads and Transport Technology, (DRTT) (1986). Cementitious Stabilisers in Road Construction. Technical Recommendations for Highways, Draft TRH13: 1986, CSIR, Pretoria, 1986.