RATIONALE FOR TWO VOLUMES

The rationale for setting out this thesis in two volumes is (a) that the subject material logically belongs in two distinct camps and (b) this makes the large volume of material more manageable. A detailed account of the circumstances leading to the development of the two volumes is given in the 'Introduction' to volume 2, and will not therefore be discussed in any depth here. However, a simple tabulation allows the reader to gain some insight into the different characters of the two volumes.

Differences between Volume 1 and Volume 2

	Volume 1	Volume 2
1	The laboratory experimental work was done in 1987, site abrasion-wear was measured in 1993, initial draft copy was informally submitted in 1994, and carefully revised in 2001.	Intensive reading and summarising of relevant technical publications commenced in 1997. Most of the write-up was done in 2000 and 2001. It is completely independent of the 1994 document, covering the subject of abrasion resistance from a quite different perspective.
2	Supervised by Professor MG Alexander	Supervised by Professor GE Blight
3	Applies mainly to pavers, and is specifically dedicated to improving the abrasion resistance of pavers.	Applies to concrete surfaces in general, and contributes to the improvement of abrasion resistance of all concrete surfaces.
4	The deductions and conclusions are based on experimental work done by the writer	The deductions and conclusions are based on an extensive literature review. This formed the basis of a considerable degree of synthesizing and theorising.
5	The mix design variables are quite limited (water content, binder content and binder type).	An extensive study is made of the concrete system, including some relatively exotic materials and processes, with a view to their effect on abrasion resistance. This study even extends beyond the boundaries of concrete, allowing comparisons to be made with ceramics, alloys, metals and polymers.
6	This investigation concluded that the MA20SA test was the most worthy of consideration as a national standard, subject to some improvements (i.e. 'CMA20') to reduce variability.	Chapter four concludes that three further abrasion tests should be investigated, suggesting that they have more merit than those used in the experimental work of volume 1.
7	1994 terminology: b/w = binder/water ratio. MGBS = milled granulated blastfurnace slag 'cbp' or simply 'blocks' are used to describe the product under investigation.	Equivalent 2001 terminology: w/b = water/binder ratio. GGBS = ground granulated blastfurnace slag 'pavers' is generally used to describe the product.
8	Limited emphasis is placed on the mechanism of wear, although wear mechanisms of three abrasion tests are considered briefly.	The wear mechanisms of 66 surface tests are considered, and a full chapter is devoted to the mechanisms of wear.
9	Appendices A through Z, except for appendix R, S and U.	Appendices R, S and U.

OUTLINE OF BOOK 1

A. Preamble

B. Volume 1

Abrasion Resistance and Related Strength Characteristics in Concrete Block Paving

C. Volume 2

Factors Affecting the Abrasion Resistance of Concrete, Mechanisms of Abrasion-wear in Concrete, and Classification of Concrete Abrasion Tests

D. References, Bibliography and Examiner's Reports

OUTLINE OF BOOK 2

E. Appendices

A.1	Aggregate data sheet	
A.2	Physical and chemical properties of OPC	
A.3	Physical and chemical properties of MGBS	
A.4	Physical and chemical properties of Matla fly ash	
A.5	Specification – PCI.TM.7.11 - Determination of abrasion resistance of concrete using a wire brush or silicon carbide grit.	
A.6	Specification – CMA20 abrasion test	
A.7	Specification - determination of visible wear using a syringe	
A.8	Statistical formulae used for the analysis of data in this thesis	
B.1-B.8	Compressive strength to SABS 1058	
C.1-C.8	Compressive strength to ASTM C140	
D.1-D.8	Compressive strength to MA20	
E.1-E.8	Tensile splitting strength to ISO 4108	
F.1-F.8	Abrasion to wirebrush method - dial method	
F.9-F.16	Relationship between revolutions of wirebrush and abraded depth of wirebrush crater	
G.1-G.8	Abrasion to wirebrush method – vernier method	
H.1-H.8	Abrasion to wirebrush method - clay method	
H.9	Determination of average specific gravity of clay	
I.1-I.8	Abrasion to ASTM C418	
I.9	Determination of average specific gravity of clay	
J.1-J.8	Abrasion to MA20	
J.9-J.16	MA20 : details of abraded groove	
J.17-J.24	Relationship between maximum depth of groove and revolutions of ball race	
J.25-J.32	Relationship between volume of groove and revolutions of ball race	
J.33-J.40	Regression analysis : log p vs log r	
J.41-J.48	Regression analysis : v vs r	
K.1-K.8	Water absorption to ASTMC140, ISAT to SABS 1058	
L.1-L.8	Water content by drying at 100^{o} C and firing at 1000^{o} C	
M.1-M.8	Results of mass measurements taken at the University of the Witwatersrand, Nov 1988	
N1-N.6	Utilization of soft wear	
R	Analysis of Sukandar(1993)'s results	
S	Extracts from Samson Construction Chemicals product list	
T.1-T.8	Relationship between water content and dry density	
T.9-T.16	Relationship between compressive strength and dry density	
T.17-T.24	Relationship between tensile splitting strength and dry density	
T.25-T.40	Relationship between abrasion resistance tests and dry density	
U.1-U.66	Catalogue of 66 abrasion tests	
Y.1-Y.48	Photographs of blocks in pedestrian sidewalk directly after installation, Westgate	
Z.1-Z.96	Photographs of blocks in pedestrian sidewalk after 5,5 years of traffic, Westgate	
Z.100-Z.196	Photographs of blocks in bus lane after 5,5 years of traffic, Westgate	