



Performance of sand seals in the Kruger National Park

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If required, position
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Organisation within
this text box

Introduction

- **First recorded visit by motor vehicles in 1927**
- **By 1930 some 450 miles of gravel roads established**
- **First surfacing of 59 km of road in 1964**
- **First bitumen supplied in drums and melted in kettle**
- **Heated bitumen transferred to tractor drawn sprayer**
- **Vehicle count in 2003 was 261,736**
- **Over 900 km of surfaced roads in 2003**

The Kruger National Park road network





Traffic - KNP

CAPSA '04

Roads - the arteries of Africa

Vehicle count for period 1 April 2002 to 30 March 2003			Total vehicles
No. of persons per vehicle			
≤ 16	≥ 17	Caravans	
255503	6233	19133	280869

Typical material properties of layer works

Layer	Material classification	Atterberg limits	CBR	OMC
Base	C3 – C4	< 6	> 72	6,8
Sub base	G5 – G6	< 13	> 45	7,2
Selected sub grade	G6 – G7	< 13	> 20	9,0

Original melting kettle





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Roads - the arteries of Africa

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Grading of the sand

Sieve size (mm)	Cumulative % passing	
	<i>KNP Limpopo</i>	<i>KNP Skukuza</i>
9,5	100	100
6,7	97,2	99,6
4,75	95,9	97,3
2,36	87,9	80,2
1,18	59,5	43,9
0,600	19,1	14,2
0,300	4	2,3
0,150	0,5	0,6
0,075	0,4	0,4

KNP Sand seal - Specification

- **Primary seal**

MC 30 @ 0,80 l/m²

150/200 pen bitumen @ 1,35 l/m² hot

River sand @ 0,011 to 0,014 m³/m²

Rolling with 22 ton PTR

Remaining sand removed after one month

- **Second day seal** (after six months)

150/200 pen bitumen @ 1,30 l/m² hot

River sand @ 0,011 to 0,014 m³/m²

PTR rolling

Spraying of the binder



Application of the sand



The rolling process





The surfacing activity raises a lot of interest



Roads - the arteries of Africa

Low dust generation



Early stages of the seal

Roads - the arteries of Africa





Road verges are natural grazing area





Maintenance Philosophy

- First reseal normally after 3 years
- Second reseal after first signs of fatigue
- Second reseal generally after 15 to 20 years

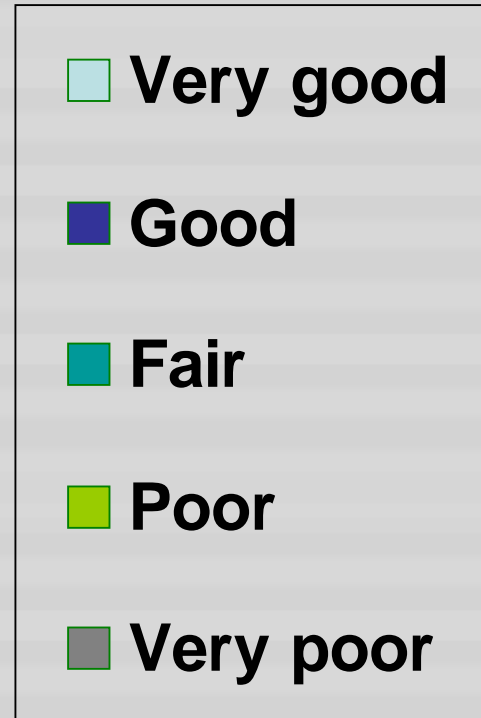
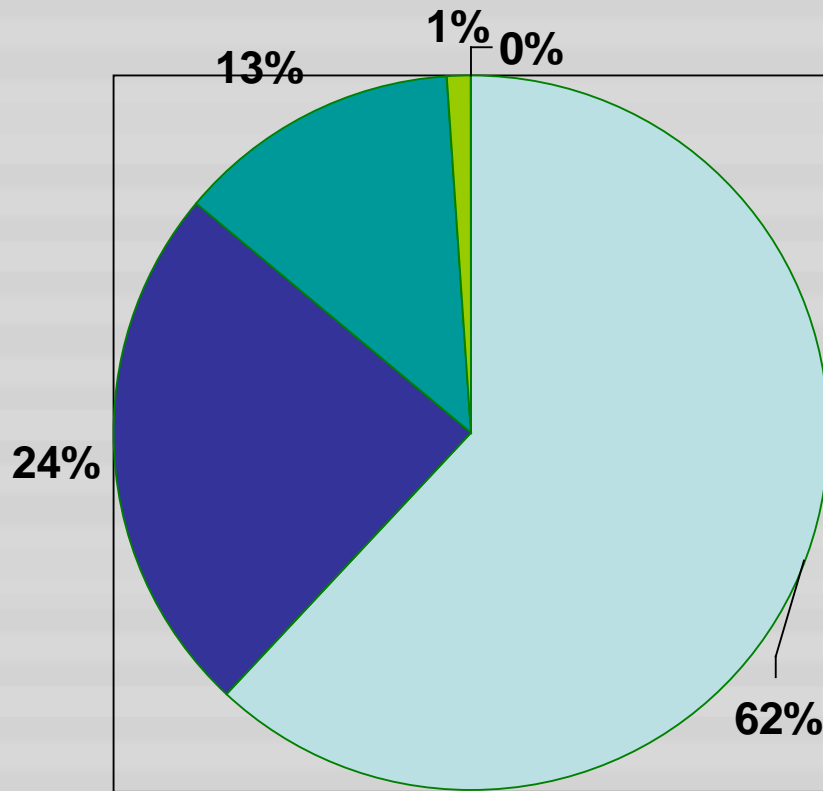


Roads - the arteries of Africa

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Condition of road network in 1999



Test results obtained on recovered binder – 35 year old seal

Property	Test result	Specification requirement of 150/200 pen binder
Ring and Ball Softening Point (°C)	79,2	36 – 43
Penetration @ 25 °C (0,1 mm)	10	150 – 200
Dynamic viscosity @ 165 °C (Pa.s)	0,315	0,12 – 0,30
Binder content (% m/m)	9,8	-

Conclusion

Success of the sand seals can be attributed to:

- * **Priming of the base**
- * **Two layered seal**
- * **High binder content of seal**
- * **Use of soft binder**
- * **Low traffic count**
- * **Good drainage**