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Road Research Laboratory

AN EXPERIMENT TO EXAMINE THE EFFECTS OF
VARYING VERGE CONDITIONS ON SOIL MOISTURE
DISTRIBUTION UNDER A ROAD IN KENYA

by

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Introduction

An increasing amount of information is becoming available on the moisture distribution which exists under road and airfield pavements overseas. Data from investigations carried out on many roads and airfields in various territories have been analysed at the Road Research Laboratory and it is evident that with the flush verges general on roads overseas, the moisture conditions under pavements may be considerably influenced by moisture exchange between the verge and the soil beneath the road. Run-off from the pavement passes on to the verge, the slope and permeability of the latter influencing the amount of water which percolates into the soil and the amount which runs off into the adjacent drainage channels. Vegetation on the verge tends to impede surface drainage, thus producing the effect of a flatter slope, but transpiration from vegetation may remove much or all of this water and reduce the possibility of downward percolation affecting the stability of the road foundation.

The importance in relation to verges of the four factors (i) surface permeability, (ii) slope, (iii) impedance to run-off and (vi) transpiration by vegetation would appear therefore to determine whether the average moisture content of the soil beneath the edge of the pavement is, over a yearly cycle, greater or less than the moisture content under the centre of the road.

To investigate this matter further a length of experimental road, having a variety of verge treatments, has been constructed near Nairobi, Kenya in co-operation with the East African Agriculture and Forestry Research Organisation and the Ministry of Works, Kenya. This note describes the construction and instrumentation of the experimental road. It is proposed to issue further notes with the measurements from the experiment at intervals of one year.

It is not possible to say how long the experiment will continue. One of the aims of the experiment is to trace the changes in moisture conditions which occur from the time of construction until normal seasonal changes take over as the main influences. The experiment will be continued to establish this normal seasonal pattern.

Details of the lay-out of the experiment

The construction used for the road itself is typical of pavements now being laid in East Africa. The carriageway is 15 ft wide and the verges are each 7 ft wide. The base consists of a nominal thickness of 6 in. of a lime-stabilized gravel, and the surfacing of a double surface dressing with $\frac{1}{2}$ in. chippings. The experimental length is divided into three sections each of 60 ft length, and three methods of verge treatment are being investigated.

These are:

- (i) Impermeable treatment - 7-8 in. below the surface a polythene sheet, was laid over the entire width of the verge and carried up to the carriageway edge.
- (ii) Permeable treatment - layer of loose gravel laid, 2 in. thick over the bare soil.
- (iii) Grass cover - the verge was sealed and planted with deep rooted Kikuyu grass.

SUMMARY

The moisture conditions under road pavements overseas may be considerably influenced by moisture exchange between the verge and the soil beneath the road. This Note describes the construction and instrumentation of an experimental road built with flush verges near Nairobi, Kenya, to investigate the effect of varying the slope and method of treatment on the sub-grade moisture distribution. The road, 90 yards long, has been constructed with a 16 ft wide lime-stabilized gravel base and double surface dressing. The verge slopes are 1 in 35 and 1 in 14, the verge treatments being as follows;

- (i) deep-rooted Kikuyu grass,
- (ii) a 2-in. thick layer of gravel, unsealed,
- (iii) a polythene membrane laid across the verge at the level of the road base.

One of the aims of the experiment is to trace the changes in moisture conditions which occur between the time of construction and the time when normal seasonal changes take over as the main influences. The experiment will be continued to establish this normal seasonal pattern.

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The verges on each side of the road have been provided with different slopes (1:14 and 1:35), to investigate the effect of slopes. The various verge treatments were repeated on both sides of the road as shown in Fig.1.

The experimental site

To facilitate arrangements for the staff of E.A.A.F.R.O., responsible for recording the instrument readings and also to improve security arrangements, it was decided that the experimental road should be constructed within the grounds of E.A.A.F.R.O., 15 miles from Nairobi. Space for a new section of road on natural soil was not available, but several gravel roads already existed and a section of gravel road was made available for reconstruction as the experimental site.

A preliminary survey of the site was carried out by the Materials

out using the ripper of a grader. Further mixing in the dry condition was carried out with the blade of the grader, the material being moved from one side of the formation to the other. The base material was then wetted by spraying from a water bowser and the final shaping and mixing was carried out using the blade of the grader. The base was then compacted with a 10 ton smooth wheeled roller. An approximate width of 16 ft of base material was stabilized and compacted. A seal coat of width 15 ft, with $\frac{1}{2}$ in. chippings was then applied to the pavement. This part of the work was completed on the 25th February, 1961.

Immediately following the construction of the road pavement, hand labour was engaged to dig out two sections of verge, A and D to the depth* of the stabilized base prior to the laying of the polythene sheeting, and a further two sections of verge, C and F to a depth of 2 in. in readiness for the 2 in. thick layer of gravel. Care was taken that the slopes were maintained at the formation of the dug out verges.