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# PERFORMANCE EVALUATION OF SOME NIGERIAN ROADS

NIGERIAN BUILDING AND ROAD
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## PERFORMANCE EVALUATION OF SOME NIGERIAN ROADS

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**Foreword**

This report describes the use of the Bump Integrator as a simple and powerful tool for economically evaluating the performance of individual roads and for prioritizing roads for mainentance schedules.

The Bump Integrator measures the road roughness which analysed with other parameters can provide performance criteria for the road. When this exercise is carried out at regular periodical intervals over a number of years, the peformance of any road can be better assessed and the maintenance needs highlighted.

In this report, three busy roads namely the Port- Harcourt-Enugu Expressway, the Ibadan — Lagos Expressway and the Benin — Asaba Highway are investigated. It is hoped that the results of this investigation will be of benefit to the various road maintenance organisations in Nigeria.

A.C. Madedor
Director

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## 1. INTRODUCTION

The general principle of any pavement surface is to maintain a true planar surface which is free from defect after construction. This principle is never completely achieved due to instability of the subgrade or the imposed layers which constitute the pavement thickness. Instability is a result of some microscopic deformations which occur in the subgrade or within the imposed layers and due to age and constant application of load, increased in magnitude to introduce distortions on the surface of the pavement, and in some cases lead to eventual structural collapse of the pavement. These distortions constitute the pavement surface roughness. The study of the interface between the pavement and the vehicle therefore is aimed at generating reliable data for highway maintenance programming and overall pavement performance evaluation. Road roughness measurements, is in effect, an integration of vehicle vibrations and shocks as the tyres roll over the pavement.

In technical terms, road roughness can be defined as the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic pavement loads and pavement drainage. Road roughness is directly related to riding comfort and safety of vehicle operation particularly at high travel speeds (i.e. over 55 kph). It is common knowledge that on bumpy roads, drivers operating above advisory speeds stand the chance of losing control particularly at sharp curves. The tyre wears also depend on the roughness index of the pavement. It is apparent from the above discussion that road roughness index is the primary descriptor of the overall performance of the pavement. The above fact was recognised by the International Road Roughness Conference held in Brasilia in June 1982 (1). It was generally agreed by the conference participants that optimization of road transport efficiency involves balancing of high initial capital investments required for smooth roads with low maintenance against low capital investments with high maintenance and vehicle operating costs for rough roads. Hence, the road roughness index provdies quantitative criteria for:

(i) assessing riding surface quality of any road.
(ii) comparing the riding comfort of two or more roads.
(iii) assessing the need for renewal.
(iv) comparing the relationship between road user cost and road roughness.
(v) correlating road roughness and frequency of accidents in a particular roadway section.
(vi) determining the relationship between pavement roughness and skid resistance in rainy tropical roadway condition.
(vii) assessing the standard of work from various construction agents and hence creating competition among construction industries.

## 2. STATE-OF-THE-ART IN ROAD ROUGHNESS MEASUREMENTS

Road roughness can be measured by using any of the two methods:

(i) Visual surveillance and driver ridability rating.
(ii) Response-type equipments which measure surface roughness as a dynamic response of the measuring equipment to that roughness. A brief discussion of each type of equipment is important in order to highlight the output of each equipment and inherent advantages.

### 2.1 Visual Surveillance and Driver Ridability Rating

Driver ridability rating and overall visual surveillance of a highway is the traditional method of evaluating highway deformation and facility maintenance. It is usual to have two to four drivers drive along a section of a highway at a given speed after which they are required to complete questionnaires on the state of the roadway inventory. In some cases, similar questionnaires are distributed to randomly selected vehicle drivers for their response. In the above two survey methods, useful information can be generated from the questionnaires and photographs of road deformations. However, experience has shown that driver ridability ratings are in most cases subjective. The fact that a rural driver and urban driver have different conception of road roughness justifies the above statement. It is apparent that driver biases can be reflected in the ratings. This situation makes data analysis inconsistent.

From the above discussions, visual surveys and driver ratings are of limited use. There is a great need to adopt a more quantitative technique such as the use of a road roughness equipment. However, it can be used as a support