

AN ASSESSMENT OF SYSTEMS FOR
THE STRUCTURAL EVALUATION OF
ROAD PAVEMENTS

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by

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ABSTRACT

The Public Works Department (PWD) Malaysia has had extensive experience of using the Road Rater and the Falling Weight Deflectometer (FWD) for evaluating road pavements. The deflection data from these devices have been interpreted using different methods of analysis. In order to identify the most appropriate system for future use, the PWD embarked on a study to compare the performance of the Road Rater and the FWD and the available methods of analysing deflection data.

A comparative study between the two devices did not yield conclusive result. However, a further study of six alternative analysis programs showed that the FWD, though comparatively more expensive, was more effective in the non-destructive testing of road pavements.

The computer programs studied were Hogg's model, BISDEF, DEFMET, BAKANAL2, PHONIX and system PEACH. With System PEACH, a Simplified Elastic Analysis Method (SEAM) has been developed to improve on the available methods of pavement analysis. The resultant System PEACH, which consists of the computer program LAYCALC2, SEAM and a knowledge base, has been shown to be a reliable tool for assessing the structural condition of the road pavements when used with FWD data. Of the commercially available analysis packages investigated, the PHONIX program linked with FWD data, compared best with empirical tests.

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CHAPTER 1

INTRODUCTION

1.1 Roads in Malaysia

Malaysia, a developing country in South East Asia, has a population of seventeen million people. It comprises of Peninsular Malaysia and East Malaysia which are separated by the South China Sea. Peninsular Malaysia has twelve states with a land area of 134,680 sq. km. East Malaysia, which consists of Sabah and Sarawak, has a land area of 202,020 sq. km. The total length of roads maintained by the Public Works Department (PWD) in the country is approximately 40,000 kilometres, out of which 78% are paved while the rest are either gravel or earth roads (1). There are 443 km of completed tolled expressway mainly in Peninsular Malaysia, 12,165 km of Federal roads (20 % in East Malaysia), 26,516 km of State roads (31 % in East Malaysia), with the remainder made up of minor roads, which are largely unpaved (1). Figure 1.1 shows the road network in Malaysia.

The roads have been constructed in different terrains and on soil types ranging from coastal alluvium to residual soils inland. About 20% of the roads were constructed two or three decades ago without the benefit of an accepted national standard for highway construction. These roads mainly consist of a Telford base type of construction. Roads constructed in recent years have normally been designed broadly to either Road Note 29 (2) or the AASHTO method (3) and more recently based on the Technical Instruction 5/85 (4). The construction of these later roads was carried out by the PWD of Malaysia. The road pavements consist mainly of sand or laterite sub-base, graded crushed stone base and a bituminous surfacing of either surface dressing, semi-grout, bituminous macadam or asphaltic concrete. However, these road pavements have frequently been overlaid with asphaltic concrete over the years. Figure 1.2 shows the types of pavement structures commonly used in Malaysia.