

An Experimental Study on Assessment of Pavement Interlayer Bond Strength

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ABSTRACT

It is a common practice to apply a tack coat usually in the form of bituminous emulsion over an existing bituminous surface before laying another bituminous layer. The boundary between these two consecutive bituminous layers is the layer interface and the pavement stress distribution is highly influenced by the adhesion conditions at this interface. Poor adhesion causes adverse effects on the structural strength of the pavement system. A number of premature failures such as slippage failure and delamination failures result thus defeating the construction objectives. In the absence of a standard method and apparatus to address this field problem, an attempt has been made in this study to develop a simple testing arrangement to be used in a laboratory to determine the interlayer bond strength. Normal Marshall procedure has been used to prepare the specimens consisting of two different types of bituminous materials in lower and upper part of the same specimen. It is observed within the scope of study that Cationic rapid setting (CRS-1) emulsion applied at 0.25 Kg/m² offers the best results of interlayer bond strength.

Keywords: Interlayer Bond Strength, Marshall Specimens, Tack Coat, Fabricated Interlayer Bond Test Device

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1. INTRODUCTION

Highways are considered to be the backbone of a country's growth and development. All developed as well as developing countries normally have a continuous program of sustaining and building road infrastructures. One way to improve the existing road infrastructure in view of increased traffic is to strengthen the existing bituminous layer by overlaying with another bituminous layer of appropriate material composition and thickness. Even in new constructions, the upper bituminous layer is laid much after the lower bituminous layer is constructed. The boundary between these two consecutive layers is the layer interface and it is usually believed that, the pavement stress distribution is highly influenced by the adhesion conditions at the layer interface. Poor adhesion at layer interface may cause adverse effects on the structural strength of the pavement system. A number of premature failures such as slippage failure and delamination failures [2] as shown in Figure1 may take place. This happens due to improper bonding between the two bituminous layers and the two layers do not act together in unison. To increase the adhesions between two layers, bitumen emulsion is normally used as tack coat prior to overlay on an existing or newly constructed pavement layer. The most vulnerable locations of occurrences of such failure are where traffic is accelerating or decelerating, such as at traffic signals and on horizontal curves [8]. For sustainability of the composite bituminous layer structure to face the increased traffic loads, it is essential to have the maximum interlayer bond strength between the two layers and this depends on factors like type of emulsion used as tack coat, the quantity of emulsion applied and test temperature [4, 5]. It has been reported that the interlayer bond strength between such two layers decreases significantly with increase in temperature [7]. The main objectives of this work are to fabricate a simple device that can be used in a laboratory to assess the interlayer bond strength between two bituminous layers joined by a tack coat and also, explore the best conditions for developing the bond between two specific bituminous layers in form of rate of application of emulsions.



(a) Slippage Failure



(b) Surface Layer Delamination

Figure 1. Premature failures due to interlayer bond failure

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