

## EVALUATION OF RUTTING POTENTIAL FOR CRUMB RUBBER MODIFIED BITUMEN IN ASPHALTIC MIXES

S. Shankar and C.S.R.K. Prasad

National Institute of Technology, Transportation Division, Department of Civil Engineering,  
A.P, Warangal-India-506004.  
Email: shreebunty@gmail.com

(Received January 2009 and accepted September 2009)

الأرصدة المرنة مع سطح من القار تستخدم على نطاق واسع في الهند. ارتفاع الكثافة المرورية من حيث الحركة التجارية والشاحنات والحمولة الزائدة للمركبات مع وجود تباينات كبيرة في درجات الحرارة اليومية والموسمية للأرصدة كانت مسؤولة في وقت سابق عن تطوير أعراض الضغط. التحقيقات في الهند والخارج، كشفت أن خصائص القار و مزيج القار يمكن تحسينها لتلبية الاحتياجات الأساسية. في هذه الدراسة ، جرت محاولة لاستخدام قار فقات المطاط المعدل (CRMB 55) الذي يتم مزجه في درجات حرارة معينة. تصميم مزيج مارشال تم تنفيذه من خلال تعديل محتوى القار تحت أقصى درجة ثبات لمحتوى المطاط والتجارب اللاحقة كانت لتحديد خصائص كل مزيج مختلف و لخصائص القار التقليدي (70/60) أيضاً. أدى ذلك إلى تحسن كبير في الخصائص بالمقارنة مع خصائص القار الأصلي وأيضاً القار ذو درجة الربط المنخفض (5.67%). تم اخذ عينات لإجراء اختبار تتبع العجلة، تم إعداد الاختبار باستخدام جهاز محاكاة أسطوانة الـ "التسوية" و تم تحليل النتائج لتحديد العدد المتوقع لمرور العجلات القياسية على الإسفالت الممزوج بالقار التقليدي و الإسفالت الممزوج بالقار المعدل.

Flexible pavements with bituminous surfacing are widely used in India. The high traffic intensity in terms of commercial vehicles, over loading of trucks and significant variations in daily and seasonal temperature of the pavement have been responsible for earlier development of distress symptoms. Investigations in India and abroad have revealed that the properties of bitumen and bituminous mixes can be improved to meet the basic requirements. In the present study, an attempt has been made to use crumb rubber modified bitumen (CRMB 55) which is blended at specified temperatures. Marshall's mix design was carried out by changing the modified bitumen content at constant optimum rubber content and subsequent tests have been performed to determine the different mix design characteristics and for conventional bitumen (60/70) also. This has resulted in much improved characteristics when compared with straight run bitumen and that too at reduced optimum modified binder content (5.67%). Specimens for the conduct of wheel tracking test have been prepared using simulated roller compaction equipment and analysis has been carried out to determine the expected number of standard wheel repetitions for both conventional and modified bituminous concrete mixes.

**Keywords:** Pavement, Bitumen, Bituminous surfacing, Crumb rubber, Traffic intensity.

### 1. INTRODUCTION

Poor performance of bituminous mixtures under increased traffic volume and heavier axle load has led to the increased use and development of modified binders. In India, it is estimated that over 33 lakh kilometers of road exists and out of which around 50% is surfaced <sup>[1-2]</sup>. Road transport has acquired dominant position amongst the various modes of transportation system due to its flexibility, door-to-door service, reliability and speed. In India, road transport carries close to 90% of passenger traffic and 70% of freight transport <sup>[3]</sup>. In India, majority of the pavements are bituminous since they consume lesser initial cost when compared with rigid pavements i.e. cement concrete pavements. Investigations in India and countries abroad have revealed that properties of bitumen and bituminous mixes can be improved to

meet requirements of pavement with the incorporation of certain additives or blend of additives <sup>[4]</sup>. These additives are called "Bitumen Modifiers" and the bitumen premixed with these modifiers is known as modified bitumen. Modified bitumen is expected to give higher life of surfacing (up to 100%) depending upon degree of modification and type of additives and modification process used. Different types of modifiers used are Polymers, Natural Rubber and Crumb Rubber

### 2. SCOPE OF RESEARCH

There have been numerous research studies on bitumen as paving material. The bitumen undergoes the different changes (Low temperature cracking, fatigue cracking ageing and water receptivity) due to high traffic intensity, high axle loads, variation in