

Review on Performance Study on Mastic Asphalt at Rotary Section

Ritu Gupta¹, Ajay K.Duggal²

¹ M.E, Student, Department of Civil Engineering, NITTTR, Chandigarh, Punjab, India

² Associate Professor, Department of Civil Engineering, NITTTR, Chandigarh, Punjab, India

ABSTRACT: Development of road network is major pillar of the economic growth. Flexible pavements are being constructed on a very high volume in the India. As a developing nation and the second highest populated country in the world, there is need of high-volume duty roads. At certain critical locations like rotary, toll plaza and bridge deck slab etc. use of mastic asphalt is widely adopted. The performance of mastic asphalt as substitute to normal bituminous mixes at critical location such as rotary, bus stops and intersections need to be studied. This shall help in decision making with respect to choice of surface course. This paper presents a critical review on the use of the mastic asphalt as a wearing surface which possibly has significantly higher resistance against rutting and other deteriorations. It also has higher stiffness of the matrix, resistance against stripping and aging behaviour of material.

Key words: Mastic asphalt, distress, bitumen content and hardness value.

INTRODUCTION

India as a developing nation requires a vast expansion when it comes to infrastructure. Although, there are some cities which have well-planned and developed infrastructure but there is a major concern of population growth which continuously increases the need for maintenance of the infrastructure. In the past decade, the population of Chandigarh has been increasing rapidly at a rate of over 5 percent per year. In this time, there has been a remarkable rise in the population of automobiles, in particular the two and four wheelers, and their use has increased due to household incomes growing. Chandigarh is an urban hub for many states therefore large traffic is added to the roads of Chandigarh due to trade, health as well as educational facilities.

These key concerns open-up the door for researchers to study some ideal material which shows high potential to prove its worth for the use as a pavement material. Due to high stability, strong longevity, relatively low maintenance and better riding consistency, mastic asphalt is theoretically beneficial for paving content. Mastic asphalt has achieved broad recognition in road construction technologies and will further gain wide acceptance. This paper focusses on the potential use of the mastic asphalt on the wearing course for the different conditions of heavy-duty road pavement.

PAVEMENT DETERIORATIONS AND ITS TYPES

The four main types of common bituminous pavement surface distress are described in IRC: 82-2015:

1. Surface deformation: These include rutting, corrugations, shoving including those caused by layer

slippage, shallow depressions, settlement and upheavals etc.

2. Surface defect: Fatty surface, smooth surface, streaking and hungry surface.

3. Disintegrations: Stripping, loss of aggregates, ravelling, potholes and edge breaking.

4. Cracks: All types of cracks i.e. hair-line cracks, alligator cracks, longitudinal cracks, edge cracks, shrinkage cracks and reflection cracks.

There is no specific mention to mastic asphalt with respect to defects. Therefore it is presumed that major type of deteriorations on surface of mastic asphalt that may occur are i.e. fatty surface, hair-line cracks and various types of cracks.

NEED AND SCOPE OF STUDY

The Chandigarh city have large traffic interaction with the neighbour areas. In the absence of an adequate and high-quality mass transport system, individuals use customized modes that not only contribute to road network congestion, but also increase the amount of traffic. At critical locations such as rotary, intersection and bus stops, the road surface is not only subjected to heavy traffic load but also sudden horizontal stresses due to braking and sudden acceleration. The inability to sustain such forces by bituminous mixes necessitates the requirement of mastic asphalt or concrete for use as wearing course. In addition certain specific locations like toll plaza, signalized intersection, rotary etc. are subjected to excessive stress due to acceleration, braking action and hence shoving and deformation of bituminous surfacing

are commonly observed. In Chandigarh city mastic asphalt has been used in place of bituminous concrete for at such locations (example – rotary junction), but there is no study on performance of mastic asphalt at rotary section in Chandigarh city. Hence aim of this study is to focus on the performance of mastic asphalt as a wearing course at rotary section. This can be done by Malaysia study of aging behaviour, present condition, defects on pavement surface and to suggest remedial measures so as to improve the pavement life. .

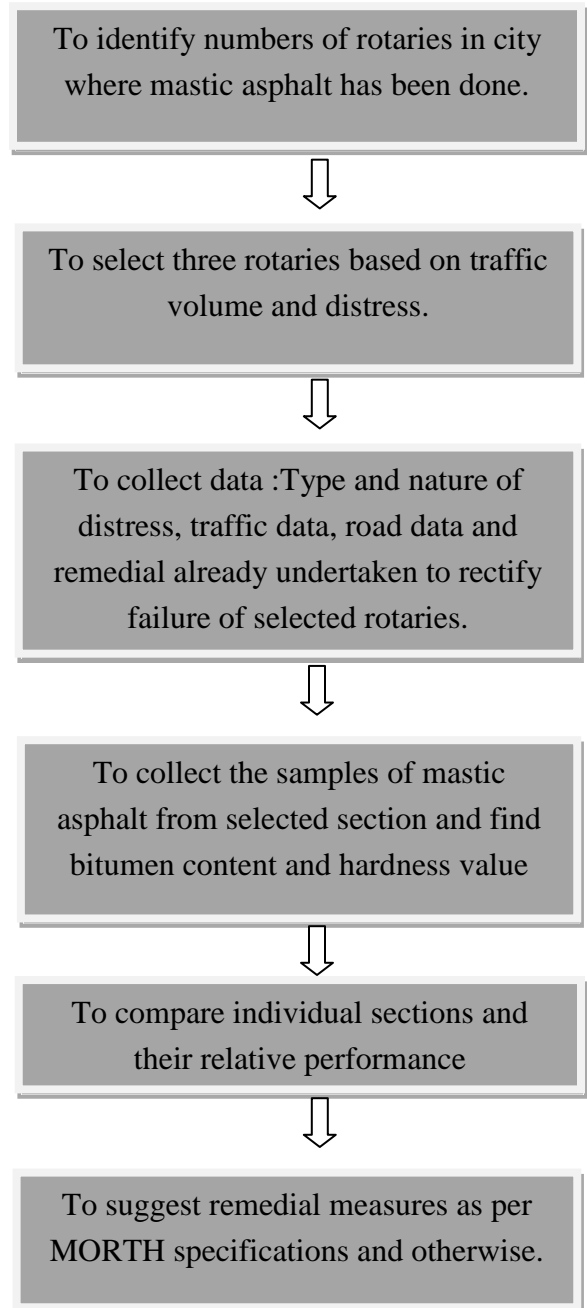
OBJECTIVES

The key goals of this research are:

1. To measure the different distresses on mastic asphalt at rotary sections and ascertain the reasons for their development.
2. To compare the nature and extent of distress on mastic asphalt at individual rotary sections and their relative performance.
3. To suggest certain critical parameters and possible remedial measures pertaining to performance of mastic asphalt based on the study.

METHODOLOGY

In this research work, the step-by-step method on how to perform the analysis is given:



LITERATURE SURVEY

Benjamin J smith et.al [2000] the effect of finely dispersed fillers on asphalt binders' fatigue efficiency at relatively low temperatures was investigated. The fatigue testing of the asphalt mastics was carried out using a rectangular torsion test fixture in a complex rheometer at 10 ° C and 40 Hz. In fatigue work, this testing procedure is popular and consists of adding torsional oscillations to the specimen under constant strain amplitude. The initiation and propagation of cracks in these constant strain

experiments allows the stiffness of the specimen to decrease, resulting in a decrease in stress as the test proceeds. Tests of asphalt concrete fatigue on dense and gap-graded systems prepared with two separate soil calcareous fillers indicate that the size of the particles may not have a substantial effect on the fatigue life of the mixes. These studies further confirm that the main mechanism responsible for enhanced fatigue efficiency is crack pinning.

Nuha Salim mashaan et.al [2013] investigated the effect of adding crumb tyre rubber as an additive in stone matrix asphalt. Essential aspects of modified asphalt mixture are to improve the influence of CRM modifier on volumetric, mechanical stiffness were also evaluated. Various percentage of crumb rubber mix 6%, 12%, 16%, 20% were used with virgin bitumen. They concluded that appropriate amount was 12% by weight of bitumen which increases stability. Resilient modulus of modified sample was higher as compared to unmodified samples.

Ashish Talati et.al [2014] studied split mastic asphalt for the flexible pavement. Due to temperature variations in India pavement are subjected to different distresses. Rutting is the major distress caused in which quantify mechanism and reduction of effective rut depth were studied. They concluded with the remark that marshal and SGC method provide similar result except marginal difference in case of density values.

KumKum Bhattacharya et.al [2014] emphasized on various alternative for urban flexible pavement which increases in durability, life and cost effective. They also focused on the damage analysis which can be analysed by the use of KENPAVE Software for each alternative and compare cost analysis. Using KENPAVE tools, it is possible to test various alternative criteria for the harm analysis and its vulnerability to rutting and different distresses.

Naiyara Khan et.al [2016] described future need of road network in Chandigarh. In view of the sub-grade situation, traffic data, history of failure, this study review was conducted on a few experimental stretches at selected locations (road stretches in Chandigarh city). On these selected stretches, common categories of distress were described. It can be inferred from the restricted investigation carried out that the breakdown of the stretches of the road can be attributed to one or more causes, as many variables of different degrees of importance can interact to cause a road to collapse or to acquire defects. In seeking long-term solutions, the conclusions drawn from the inquiries are valuable.

Kaushik Neogi et.al [2016] discussed about the high frequency induction curing of porous asphalt concrete. By

the use of high frequency induction curing on AC curing makes concrete durable, electrically conductive and more reliable etc. due to which some micro cracks are developed than temperature is increased by induction heating of steel wires which repair the micro cracks. Thus, progressive disintegration of pavements is prevented.

CONCLUSION

The present study shall enable to not only predict the present but also future performance of mastic asphalt in terms of pavement life, bitumen content and hardness value. It shall also help to ascertain an Aging behaviour of mastic asphalt that can be mapped in terms of reduction of binder content and hardness value with respect to time (years). The remedial measures that may be suggested shall also help reduce cost and time required for effective maintenance work. This is also improve safety and comfort for all users of the road.

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