ACCOMPLISHMENT OF BITUMINUOUS CONCRETE MIX USING MODIFIED BINDER

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Abstract: Investigations have been carried out in India and countries abroad to find out the properties of bitumen and bituminous mixes and by the methods by which they can be improved to cope up with the above defects of pavements and with the incorporation of certain additives or blend of additives. These additives that are added to enhance the binders are called "Bitumen Modifiers" and the bitumen premixed with these modifiers is known as "Modified Bitumen". Modified bitumen's performance depends upon the degree of modifications and type of additives and modification process used. The time period of next renewal is expected to extend by 50 per cent in case of surfacing with modified bitumen as compared to normal period indicated for conventional bitumen. For example, if normal renewal cycle is 4 years, this may be enhanced to 6 years in case of modified bitumen. Full scale performance studies carried out under the ages of Ministry of Road Transport and Highways, New Delhi , Central Road Research Institute , New Delhi , Highway Research Station, Chennai, Rubber Board, Kottayam, Gujarat Engineering Research Institute ,Vadodara and Kerala Public Works Department revealed that the use of Modified Bitumen in construction/ maintenance of bituminous roads is cost effective, when life cycle cost is taken into consideration. The choice will in nut shell depend ultimately upon life cycle costing of overlays and renewals using ordinary bitumen and modified bitumen for prevailing traffic and climatic conditions. It will also depend upon the type of the pavement constructed. The need for bituminous binders has aroused due to the pavement failures. Pavement failures are one of the important issues in the entire pavement system.

Keywords : **Bituminous mix, Marshall Test, Stability, Aggregates, zycotherm.**

INTRODUCTION

Bitumen is a mixture of different organic materials, mostly of carbon and hydrogen. It is produced through vacuum distillation of petroleum. The viscoelastic behavior changes with temperature from solid to fluid and by cooling back in the original consistence. The bitumen binder can go through various problems in the field such as stripping from the aggregate, which can lead to cracking, rutting, depressions and potholes etc. Thus the binders can be modified by adding an additive to enhance its various properties. This binder in which an additive is added to make it better in its performance is called as modified binder. Modified binders are those bituminous binders whose properties have been modified by the use of additives.

Materials

Aggregate and bitumen are the basic ingredients of bituminous mixes. Further on the basis of size of particles aggregates are further divided into coarse aggregates, fine aggregates and filler fractions. Materials used in bituminous pavements are discussed below:-

- **Coarse Aggregate**

Impact value, abrasion value and crushing strength of coarse aggregates should be good enough to withstand the design loads within the design life span. All the stresses coming on the wheels are beard by coarse aggregates. Wear due to abrasion is also to be resisted by coarse aggregates. That portion of the mixture which is retained on 2.36 mm (No. 08) sieve according to the Asphalt Institute is termed as Coarse aggregates.

- **Fine Aggregate**

In coarse aggregates between the particles voids remain, those voids need to be filled. Those voids which remain there are filled by fine aggregates. So to fill the voids of coarse aggregates is the main function of Fine aggregates. Crushed stone or natural sand generally is termed as fine aggregates.

- **Filler**

After the voids are filled in coarse aggregates by fine aggregates, some of the voids still remain unfilled. Function of the fillers is to fill up the voids. Fillers used may be , stone dust, concrete dust.

- **Bitumen**

Bitumen is used as a water repellant material.

BACKGROUND

The past decade (2001-10) marked a major surge in the use of modified bitumen for roads and airports, especially the use of crumb rubber modified bitumen (CRMB) and polymer modified bitumen (PMB). The Indian Roads Congress (IRC) brought out a special publication (IRC: SP: 53) in 1999 to provide tentative guidelines on the use of modified bitumen in road construction. Although that publication had four different specifications for PMB (elastomer), PMB (plastomer), CRMB, and natural rubber modified bitumen (NRMB), unfortunately it was implied that their performance was equal in absence of any recommendations for their use for specific traffic and/or climatic conditions. In another setback, IRC:SP:53 was revised in 2010 with one notable feature in that the specifications for different types of modified binders were unified into one specification irrespective of the modifier type or its concentration. Obviously, to accommodate the CRMB, the minimum elastic recovery requirement was reduced for all modified binders including PMB with elastomer.

Fortunately, most progressive contractors are not using the downgraded 2010 version of IRC: SP: 53; they would rather use PMB with elastomer which meet the enhanced elastic recovery requirement as in 1999 version of the IRC:SP:53.

There is gross inadequacy of published data in India on relative field performance with and without different binder modifications under typical conditions of loading, climate, and their combinations. Until relative field performance data is obtained in India, there is no other recourse but to rely on similar data or experience in the developed country.

OBJECTIVE

The main objectives of this investigation are:

- To compare the Marshall properties modified samples with conventional sample.
- To analyze the results of Marshall tests of modified binder mixes for deciding the optimum binder content (OBC) and best modifier for further studies.
- To study the characteristics of modified bitumen with the nano- material as additive.

SUMMARY

Since the asphalt concrete pavements go under failure problems at different temperatures and moisture condition and for many years many scientists and researchers used different kinds of materials and variety of methods for improving the properties. So it became necessary to provide the best possible way to get rid of these failure problems. In this study zycotherm nano material at three different percentages by weight of binder is used with three different binder contents in the mixes and later the properties were investigated.

As a result the addition of zycotherm has changed the properties to a great extent. From these results it can be conclude that rutting and fatigue problems are decreased to a great range.

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