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Ultra Thin White Topping

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Abstract - Paper consists of subsistence of highway road and improvement in low cost and increasing the strength and vitality of the pavement. Ultra-Thin White Topping may be defined as a concrete cover with closely spaced joints and bonded to an existing bituminous pavement. It consists of a fine layer of high durability, fibre-reinforced concrete laid over a clean, milled surface of distressed bituminous concrete pavement, to achieve full or partial bonding. From the degradation summary it is identified that even after 10 years, the riding quality of Ultra-Thin White Topping is the most admirable and the most desirable one without any mediation. Structural collapse emerges from the action that contrarily affects the traffic volume carrying capacity of the pavement. This structural collapse can be overcome by using Ultra-Thin White Topping pavement over bituminous pavement. Ultra-Thin White Topping achieves very low End User Cost values thus resulting in the maximization of Gross Economic Benefits than that of ordinary bitumen overlay.

Keywords - *Ultra-Thin White Topping, Portland cement Concrete, Thin White Topping, Conventional White Topping, Hot Mix Asphalt.*

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I. INTRODUCTION

Thin White Topping:

Portland Cement Concrete (PCC) overlay on an existing bituminous pavement is commonly known as white topping.

The principal purpose of an overlay is either to restore or to increase the load carrying capacity or both, of the existing pavement. In achieving this objective, overlays also restore the ride-ability of the existing pavement which have suffered rutting and deformations, in addition to rectifying other defects such as loss of texture.

Conventional White topping:

Consists of PCC overlay of thickness 200mm or more, which is designed and constructed without consideration of any bond between existing overlay and underlying bituminous layer (without assuming any composite action). CWT thickness is typically more than 8 in. White Topping is designed and constructed without the need to consider the bond strength between the PCC and the underlying HMA layer.

Thin White topping:

It has PCC overlay between 100-200 mm. It is either considering bond between overlay and underlying bituminous layer or without consideration of bond. High strength concrete (M 40 or higher) is normally used to take care of flexure requirement. Joints are at shorter spacing of 0.6 to 1.25m. Thin White Topping thickness is typically between 4 inches and 8 inches. In general, the Thin White Topping is the designed with consideration of establishing a reasonable bond between the PCC and the underlying HMA layer.

Ultra-Thin White topping (UTWT):

It has PCC overlay of less than 100 mm. Bonding between overlay and underlying bituminous layer is mandatory. To ensure this, the existing layer of bitumen is either milled (to a depth of 25 mm) or surface scrapped (with a non-impact scrapper) or gently chiselled. Joints are provided at a spacing of 0.6 to 1.25. UTWT thickness is typically between 2 in. and 4in. The UTWT requires a good bond with underlying HMA layer to perform well as indicated by the literature (Cole 1997; Rasmussen et al. 2002; Lin and Wang 2005).

The type of bond between the PCC overlay and the underlying HMA layer is important, especially for UTWT, because the bond reduces the stresses in the thin PCC layer by transferring some of the load to the underlying HMA layer. If heating of bitumen is not allowed at any nearby location and if bituminous mix is brought from longer distances, it becomes so cold that it is difficult to be properly compacted.

Different high performance fibre reinforced concrete mixes, which may also used for making UTWT were tried in the laboratory as well as in the field using polyester,

polypropylenes and steel fibres at many research institutions in India. The basic purpose of UTWT is to improve the riding quality, load carrying capacity besides improving the subgrade/ sub base quality.

Thin white topping was started in U.S.A. The range of thickness of slab is 50-100 mm. UTW consists of smaller slab sizes because of their high surface to volume ratio, and to reduce the moisture and temperature curling and load stresses on the surface of the concrete slabs. The exact thickness of the HMA support layer, bonding condition with the HMA, traffic level, concrete strength, and slab size.

The development of an effective bond between the Plain Cement Concrete (PCC) overlay and the existing HMA pavement is critical to the performance of these rehabilitation techniques because of the existing HMA pavement is being relied upon to carry part of the traffic load. UTWT is differentiated from conventional. The use of thin Plain Cement Concrete (PCC) surfacing between 50 and 102 mm in case of UTWT. In case of very heavy traffic roads, UTWT thickness of 150 mm may also be used. The need for extensive surface preparation to promote significant bonding between the PCC mixtures to provide early opening times and the inclusions of synthetic fibres (commonly steel, polypropylene and polyolefin) to help control plastic shrinkage cracking and enhance post-cracking behaviour.

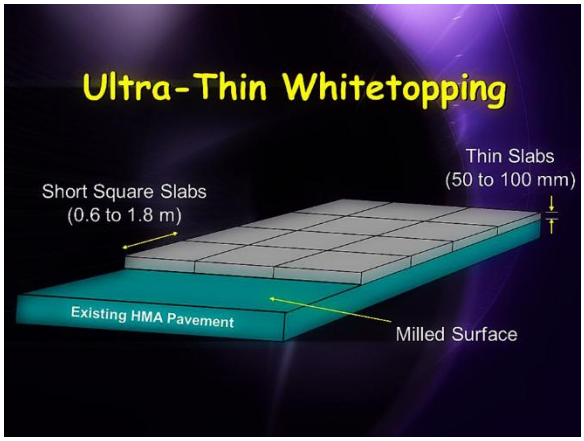

Fig no. 1

Comparison of UTWT and Flexible Pavement:

Flexible pavements are the conventional asphalts/bituminous concrete pavements whereas UTWT pavements are cement concrete pavements. In asphalt pavements grain to grain transfer of load takes place, where as in cement concrete rigid pavements layer to layer transfer of load takes place. Asphalt pavements consist of sub grade, granulated sub base, base and bituminous concrete layers. Whereas the rigid pavement sub grade and base layers.

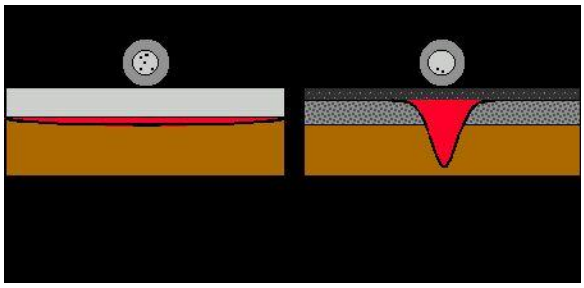

Fig no. 2

II. OBJECTIVE

1. To study the feasibility of project. The important objective of the Ultra-Thin White topping is to be reduced the maintenance cost and to increase the life span over the hot asphalt pavement. In the shortest time duration for construct over conventional cement concrete road.
2. To analyse the white topping pavement with addition of admixture and polypropylene fibre.
3. To check the feasibility of flexible pavement with white topping overcoat.
4. To verify the various field aspects of UTWT pavement for actual site conditions and the factors affecting its performance.

III. FUTURE SCOPE

This technology is mostly used for city road and where the road is having less traffic. The thickness of pavement is less as compared to conventional pavement. Then, this method improves the bearing strength of road. In this type of method the base is prepared and well compacted that is the existing surface gets compacted as it is exposed to traffic. The strength of sub base it is more but due to increase in load it fails, so to increase the strength of such pavement this technique is used. This is where fast repair is required.

IV. CONCLUSION

Ultra-Thin White Topping has emerged as a fast growing technology for pavement rehabilitation. Ultra-Thin White Topping has emerged as a competitive remedy for rutted asphalt pavement rehabilitation by offering the enhanced performance and durability of concrete. UTWT overlays are bonded to existing asphalt to create a composite section, resulting in improved performance and durability at a lower cost. UTWT develops the required strength for opening to traffic in as little as 24 hours. In order to help state highway agencies and contractors better design and apply UTW, well-controlled pavement response and performance data is needed to improve and refine the existing UTW design procedures. Positive impact on reducing CO_2 emissions resulting from the manufacturing and placement of paving materials. Based on the advantages and a lesser maintenance cost of white topping it could be concluded that

rehabilitation of an asphalt pavement by white topping is a viable and sustainable technique compared to the bituminous concrete overlay.

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