The Literature Survey on Behaviour of Asphalt Concrete Pavement using Steel Wool Fiber

Prof. Shah Rukh Kureshi[1] Neha Duryodhan[2] Ashwini Jiwane[3] Rishi Dubey[4]
[1]Assistant Professor [2,3,4]UG Student
[1,2,3,4]Department of Civil Engineering
[1,2,3,4]RTMNU University Nagpur, India

Abstract— The main purpose of this study is to provide waterproof and self heating concrete in pavement design. Asphalt concrete is a self heating concrete. In asphalt concrete, the steel fiber is assembled to make it electrically conductive and applicable for induction heating. The purpose of steel wool fiber added in asphalt concrete for improve its strength and fatigue characteristics during ductility. Cracking is one of the major problem occur on the pavement and it is directly affected to serviceability, strength, life span, quality of flexible pavement. When small amount of cracks occurs in the asphalt concrete pavement that time induction generator is used to heat the material to recover the cracks through the high temperature. During the summer season if the temperature is high, then there will be cracks start closing by themselves. It may be also promoted artificially through induction heating or by microwave heating. Performance of asphalt pavement must constantly be repaired to meet the demand of today's transportation.

Key words: Asphalt Concrete, Steel Wool Fiber, Infiltration, Induction Heating

I. INTRODUCTION

According to recent researchers, designer and manufacturer are always looking for recent improved and developed way to protect the atmosphere in the most effective ways possible. Due to high population the continuously rapid growth in traffic demand with high strength allowable in the pavement. Three main factor affecting to durability of asphalt concrete mixtures are, (1) water damage (2) Thermal cracking (3) Ageing. The department of Transportation and Highway authorities is to provide economical, durable free from cracks, safe, smooth pavement to the public. Due to the heavy load, cracking occurs on pavement. If the water infiltrate through the cracks may subsequently cause weakening and deterioration of the base and subgrade. Cracking appears at the pavement there is resettlement of pavement damage caused by cracking failure is generally expensive. Therefore there is need to implement emerging technologies which may enhance the cracking obstruction of asphalt concrete. The steel wool fibers added in asphalt concrete to increasing its strength, particle loss resistance, and fatigue resistance (stress). A mixture of asphalt concrete consisting coarse aggregate, fine aggregate, filler and binder. Healing of asphaltic material is an intrinsic property that has been reported in the late 1960s and was notice to occur at high temperature and with long rest periods between loads. Application of steel wool fiber is improve the strength of the pavement, life period as well as reduce the overall cost of the road construction.

II. OBJECTIVES

- To study introduction and advantages of asphalt concrete using steel wool fiber.
- To study the design mix procedure.
- To study the relevant IS codes related to asphalt concrete mix design.
- To study the behavior of asphalt concrete with the steel wool fiber.
- To design the flexible pavement with sufficient workability.

III. METHODOLOGY

1) Study of IS codes and literature review.
2) Selection of materials that are used such as,

A. Coarse Aggregates

Coarse aggregates is the portion of concrete which is made up of the concrete will collected from a local source, up to 4.75 mm IS sieve size. Its specific gravity was found as 2.75.

B. Fine Aggregates

Fine aggregates were collected from a local crusher with passing 4.75 mm and retained on 0.075 mm IS sieve. Its specific gravity was found as 2.6.

C. Filler

Aggregate which are passing through 0.075 mm IS sieve is called as filler. Here cement is used as filler whose specific gravity is 3.0.

D. Binder

Here 60/70 penetration grade bitumen is used as binder for preparation of Mix, whose specific gravity was 1.01.

3) Identify the characteristics of steel fiber suitable which is used in asphalt concrete.
4) Perform tests on materials
5) Prepare proportion of mix.

- The mix will prepared according to the Marshall procedure specified in ASTM D1559.
- Here Optimum Binder Content (OBC) is found by Marshall Test, where binder content is very from 0% to 15%.
- The steel wool after being cut in to small pieces is added directly to the aggregate sample in fix proportion.
- The mineral aggregates with wool and binders are heated separately to the prescribed mixing temperature.
- The temperature of the mineral aggregates is maintained at a temperature 10°C higher than the temperature of the binder.
- Required quantity of binder is added to the pre heated aggregate-wool mixture and thorough mixing was done

manually till the color and consistency of the mixture appeared to be uniform.
- The mixing time is maintained within 2-5 minutes.
- The mixture is then poured in to pre-heat Marshall Molds and the samples must prepared using a comp active effort of 75 blows on each side.
- The specimens will keep overnight for cooling to room temperature.
- Then the samples be extracted and tested at 60°C according to the standard testing procedure

IV. LITERATURE REVIEW

Alvaro GARCIA, Jose Normbena-Contereras, Moises Bueno and Manfred N, Parity (sept2014) " Influence of steel wool fiber on the mechanical ,thermal and healing properties of dense asphalt concrete" it is observed that the thermal conductivity of dense asphalt concrete reduce with the increase of dense asphalt concrete reduce with the increase of the air void content in the mixture. It has been also observed that the thermal conductivity can be improved to some extent by the presence of steel wool fibers in the mixture. This happens because the thermal conductivity can be of steel is much higher that the thermal conductivity of asphalt concrete.

Ratnasamy muniandy, Eltaher Aburkabo, Llama, M.J.Mahdi (Sept-2013) "Effect of mineral filler type and particle size on asphalt filler mastic and stone mastic asphalt laboratory measured properties." Concluded from their study the filler type and particle size plays an important role on the engineering properties of the asphalt mixture. In this study a general trend was observed that, the properties of the asphalt-filler mastic and SMA mixture increased by increase the filler particle size at given asphalt filler ratio regardless filler type.

Yashwant Pamulpati (2016) "Evaluation of Self-Healing Of Metallic Fiber." Has found that prior to healing the control mix and the mix prepared with aluminums fibers exhibited greater ultimate load at failure than the specimen with steel fiber. The induction heating experiment was conducted successfully, showing the feasibility of induction eddy current in the metallic fiber without contact to the specimen, eddy current flowed through the metallic fibers, thereby causing heat due to the resistance restricting the current.

R. A. Permana, F. P. Primmest, A. Setyawan (2018) "Characteristics Asphalt Concrete Wearing Course (ACWC) Using Variation Lime Filler" concluded from their study the stability in mixture of using lime filler tend to increased received an steady then fell. Stability highest levels of asphalt finish in 6% with lime filler 4%. The value of mix flexibility expressed in the Marshall quotient (MQ), suggests that value tend to increase the rising lime filler content into a mixture of asphalt concrete.

Aniruddha and paeveen berwal (2016) "An experimental study on behavior of steel wool fiber on bituminous mixes" has been found that one of the innovative technique in bitumen concrete. Steel wool fiber added in bituminous mixes then the result have been noticed that the considerable improvement in stability of bitumen concrete.

V. CONCLUSION

Steel wool fiber effect on the volumetric and mechanical properties of asphalt concrete. Asphalt concrete is answer to many problem faced due to used of self heating asphalt concrete. During the research it is observed the length of the fiber is change after the compaction of material. Steel wool fiber not improve the abrasion loss tensile strength of asphalt concrete. Added steel wool fiber in asphalt concrete is promote the self -heating concrete.

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