Pothole Filling Using Coldmix

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Abstract—Development of potholes on Indian roads and streets after the monsoons is a common phenomenon. Every year there are newspapers full of pictures showing potholed road pavements. Usually hot mix plants are closed during monsoons and no hot bituminous mix is available for filling potholes. Therefore, many potholes are either not repaired or repaired with old techniques. There is a need to implement an alternative method of repairing potholes not only during monsoons but also throughout the year. This can be achieved by using the latest cold mix technology for producing and stocking readymade bituminous pothole patching mix. Study was conducted in various regions of India with different climatic conditions (including hot and wet), it is believed this cold patching mix will be equally successful in India. The cold mix can be stored and remains workable for at least 6 months and, therefore, it can be used throughout the year including the rainy season.

Keywords—Cold mix, Hot Mix Asphalt, Marshall Stability, Binder, Gradation

I. INTRODUCTION

In India majority of road network is occupied by bituminous pavement only in which hot mix asphalt is used predominantly as a paving mix from many decades. However, the hot mix has some limitations. These include excessive emission of greenhouse gases (Sulphur dioxide, nitrogen oxides, carbon monoxide, volatile organic compounds, etc.) from hot mix plant. So, it sometimes becomes very difficult to go with hot mix only for rural road construction. Use of cold mix should be evaluated in these situations. Cold mix should be practiced in India for rural roads and in hilly areas having very high rainfall and place having difficult terrain because it is cost effective and environmental friendly.

II. LITERATURE STUDY

Kandhal P.S prepared the draft on the title “Specifications for readymade bituminous pothole patching mix using Cutback bitumen.” According to his studies the pothole patching bituminous mixture composed of mineral aggregate coated with bituminous material. This mix shall be supplied in 50kg plastic lined sturdy bags and can be used for patching potholes up to 75mm deep. The composition of the produced mix i.e. gradation and bitumen content can be tested by an independent or approved testing laboratory by the engineers.

Wilson T.P conducted studies to determine the combination of material and patching procedures provided with most cost-effective repair of pothole in asphalt concrete surfaced pavement. He found out that cost effectiveness was a function of many factors including material cost, labor cost, equipment cost, productivity and performance of the repairs. He identified the correlation between performance observed in the field and material properties determined in the laboratory and he concluded that such correlation would help to establish material specification based on desirable material characteristics that can give good field performance.
Berlin. M and E. Hunt conducted studies on cold mix pothole patching materials. They conducted investigations on patching material evaluation criteria, laboratory testing, material properties, cost effectiveness, application techniques, field performance and climatic factors.

Thomas H.R and D. A Anderson described results of field evaluation of five experimental binders used to produce cold-stockpile patching material for repairing in cold and wet weather conditions. The materials were compared against an MC-800 cutback and four high-float, medium-set emulsion binder. The procedures were specifically designed to minimize the cause of repair failures. Field trial using fibers are also recommended.

Estakhri. C.J and J. Button studied performance undertaken with a goal of providing methods to ensure the quality of cold-applied, asphalt-stabilized maintenance mixtures. Test procedures and acceptance criteria was developed for hot mix and cold mix asphalt concrete patching mixtures. They developed two specific objectives as a test procedure to stimulate approximately six months of stockpile aging and a test procedure to quantify workability of maintenance mixtures. This is designed to estimate the relative ability of a maintenance mixture to retain adequate workability after outdoor stockpile storage. The two test which were evaluated regarding their potential to quantify the workability of maintenance mixture are a triaxial test and an unconfined compression test. The test result indicates both procedures provide relatively good measure of workability before and after aging.

III. OBJECTIVES
The objectives of the project are:
- To develop a cold mix asphalt bituminous mix to repair the potholes
- To study the volumetric properties such as Stability, Flow, Bulk density, Percentage air voids, Voids in mineral aggregates and Voids filled with bitumen of the bituminous emulsion mixes.
- To determine the optimum bituminous emulsion content
- To promote cold mix asphalt technology as a cost-effective way to maximize the life of the road
- To develop environmentally friendly, emission free cold mix asphalt

IV. METHODOLOGY

![Diagram of Experimental Programme]

BASIC TESTS
- Tests on Aggregates and Bitumen

TESTS ON MIX
- Marshall Test

IV. METHODOLOGY

V. MATERIALS
- Bitumen of grade VG30 obtained from Public Works Department.
- Aggregates were collected from Poabs Granites Private Limited, puliyarakonam in Trivandrum city.
- M Sand passing through IS sieves of size 0.075 mm and 1.18 mm was used as filler material for the preparation of specimens
- Cutback bitumen

VI. AGGREGATE GRADATION
Specimens were prepared by using the gradation of Cold Mix Asphalt given in the IRC specification. Trial and Error method was used for proportioning of aggregates. The proportions of each aggregate to be used in the bituminous mixture are required to be determined to produce a combined gradation that meets the required specifications.
VII. CUTBACK BITUMEN

Cutback Bitumen (Liquid Bitumen) is Bitumen that is dissolved in a solvent. Solvents include White spirit Naphtha, gasoline and kerosene etc. The type of solvent controls the curing time and the amount of solvent used determines the viscosity of the Cutback Bitumen. The advantage Cutbacks have over Emulsions is much higher residual Bitumen present, typically over 80% compares with over 40-65% for Bitumen emulsions. The result is that more Bitumen content is left on the road after curing is take place, for the same volume of binder applied.

VIII. APPLICATIONS

- Surface Dressing
- Premix Carpet
- Mix Seal Surfacing
- Patch Work
- Pothole Repair

IX. ADVANTAGES OF COLD MIX

- No noise and air pollution
- Low energy consumption

X. RESULTS AND DISCUSSION

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<thead>
<tr>
<th>Test description</th>
<th>Test result</th>
<th>Specifications</th>
<th>Test method</th>
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</thead>
<tbody>
<tr>
<td>Penetration</td>
<td>62.5 mm</td>
<td>60-70</td>
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<td>Ductility</td>
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<td>Min 5%</td>
<td>IS:1205-1978</td>
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<tr>
<td>Softening Point</td>
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<tr>
<td>Specific gravity</td>
<td>1.004</td>
<td>0.97-1.02</td>
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TABLE: 3.

PHYSICAL PROPERTIES OF AGGREGATE

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<th>Test description</th>
<th>Test results</th>
<th>Specifications</th>
<th>Test method</th>
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<td>Specific gravity</td>
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<td>2.5-3</td>
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<td>Impact value</td>
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<td>10-30%</td>
<td>IS:2386(PART 4)-1963</td>
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<tr>
<td>Aggregate crushing value</td>
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<td>MIN 30%</td>
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<td>Angularity number</td>
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<td>0-11</td>
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<tr>
<td>Los Angeles Abrasion Value</td>
<td>25%</td>
<td>Max 40%</td>
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</table>
XI. CONCLUSION

Paving mix can be produced by using conventional plant or by hand. So, it can be highly used for rural road construction. Additive can be used in cold mix to make its properties comparable to the properties of hot mix curing rate and mechanical properties of cold mix can be improved. Large scale laboratory and field trials studies should improve the use of cold mixes in rural road construction for different traffic, different climate conditions and terrain conditions.

REFERENCES


