



A Review Paper on Study of Chip Sealing Over a Gravel Surfaced Road

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Abstract: -

Chip sealing or bituminous surface is a normally used process globally for metalled road a roadway. A chip seal embody of a layer of asphalt binder that is superimposed by a layer of assemblage embedded in the binder. It endows aegis to the current stratum layer from tire disservice and a skid obstruction surface texture for vehicles. Chip sealing is ponder a low cost alternative weigh to variant asphalt surfaces and so far as several transit agencies have narrow budgets, its uses is probable to maximize in the future. The government of Madhya Pradesh manage an identical amount of chip sealed roads in lane kilometres. The concentration of this paper is on observation on chip sealed gravel roads in different regions in the state of Madhya Pradesh and comparing it into the following categories regarding chip seals:



- Materials; binder and aggregate
- Standard circumstance
- Construction practices

Chip seals are used regularly in the maintenance and conservation of convergence. The chip seal is constructed by spraying the asphalt emulsion onto the asphalt roadways, then diffusion chips of clan into the emulsion, embedding the chips with air-driven and rubber tired rollers, and ultimately sweeping to recapture the excess chips. Infrequently, the methods is repeated a double seal, with emulsion sprinkle again and a second layer of chips added. The methods seals fine rift in the fundamental pavement surface, minimizing pavement decay by fend water from intruding into the base and sub grade.

Keywords: - Chip Seal, Binder, Emulsion, Asphalt, Gravel Road and Roller.

Introduction: -

Bituminous Surface Treatment, BST, is a general roadway surface handling which is used globally. It is used for two main intentions; as a new construction wearing course and as a precautionary maintenance for an existing pavement. BST, or chip seal, comprising of a flake of asphalt binder that is superimposed by a flake of aggregate embedded in the binder that furnishes, into other things, conservancy to the existing stratum flake from tire blight and a skid resistance surface texture for vehicles. Sprayed seals are a low cost alternative compared to other pavement surfaces but the roadway has to be resurfaced more frequently because a severely distressed underlying stratum will minimize the attribute of the chip seal and shorten its service life.



Chip Sealing is at first glimpse a simple method and an effortless method of causeway a roadway. Analysing available investigation and literature on the subject exhibit that there is a lot more to it. Albeit some agencies base their chip seal design norm and construction simply on experience, another have evolved more elaborate standards and base their design on engineering doctrine. It is a general consideration that design and establishment of chip seals involves a valuable degree of “art”. A lack of solid design process often incurs trial and error establishment of chip seals where the design is changed amidst the construction. Therefore it is very important that agencies that haven’t already done so start aim at “recapturing the art from the chip seal method and replacing it with solid engineering science.

Chip Sealing

Chip seals have been used since the year 1920’s in the United States when they were used as a stratum for low volume gravel roads. Since then it has been used proudly both as a new paving process and as a precautionary handling treatment for existing pavements. In Iceland, chip sealing was first used in 1978 when a 15 km section was paved in southern Iceland. Chip seals are mostly used on low volume roadways with ADT < 5,000 although some nations like South Africa and Australia use it on higher volume roads with ADT up to 50,000. The main factor most agencies have a limit on traffic volume for chip seals is because of traffic control. If speed can be limited for adequate amount of time, there are no limits on traffic volume.

Prior to there is any opinion of design methodology, it must be unequivocal that the selection of those roads that will advantage from the pavement preservation technique vested with chip sealing is the first and most elemental step in the design method. Chip seals are not meant to develop the structural competence of the pavement section. The formula for chip seal success is articulate framed by the following extract: “summarily stated the accurate accessibility to preventive maintenance is to place the right management or handling on the right roadways at the very right time”.

There are basically only two types of materials used in chip seals: vadium and aggregate. Aggregate election is a function of geography, where availability and transportation distance virtually explain the aggregate cost function. Aggregate selection is not only a function of seeking optimum gradation; it is also a function of electing the most suitable chip seal for the project. The Long-Term Pavement Program included the Specific Pavement Study 3 (SPS-3), which looked specifically at the timing of pavement maintenance actions. It found that roadways that were in poor prerequisite (i.e., exhibited high levels of distress) when a chip seal was applied had a possibility of fiasco that was two to four times greater than those that were in good condition. It also found that “chip seals seem to outperform the other management in delaying the reappearance of distress”.

Literature Review: -

Indridi Thor Einarsson 2009 works on Chip Seals Examination of design and construction in two countries this literature review shows acquaintance to chip sealing is submitted as well as two design process used for evaluating application rates of binder and aggregates, McLeod design process and Australian design process. Four chip sealing case studies, two from each field, are observed and their designs collate to the design process.

The case studies manifest convincing dissonance in the construction methods of a chip seal project amid Iceland and Washington. Oversight scale is very high at WSDOT while ICERA performs least oversight. Some flaw of the process of work was identified on all plan, some



of which were reflected on the finished stratum. Icelandic case study projects were more costly, in dollars per square meter, than the Washington projects.

Jason C. Wielinski, Joe Brandenburg and Herb Wissel works on “The Monroe Michigan Chip Seal Case Study: An Evaluation of Multiple Chip Seals ‘Cold Weather Field Performance.’” Chip seals continue to be the most repeatedly used process of pavement shielding not only in the United States but also around the world, specifically in South Africa, Australia and New Zealand. This can be attributed to chip seals reassert to be financially profitable to extend the life of pavements that are structurally sound to bear with current loads due to their lower preparatory costs compared to thin lift overlays (1). As funding for road construction and agency budgets continue to minimize, the role of pavement shielding significantly increases. These trends coupled with the betimes lucrative ability of chip seals to delay major resettlement or reconstruction of HMA pavements lead to the gist that chip seals will continue to be, or may play a larger role, in America’s transportation network.

The main purpose of this investigation was to evaluate chip seal execution for multiple test sections included with varied emulsion – aggregate amalgam with accentuation on aggregate conception specifically during winter months. Winter months (November – March) were of distinctive emphasis due to the existence of snow plough on chip seals in Michigan. Different emulsions and aggregates were desired to be evaluated to determine which performed best in this climate over the course of one winter.

Francis O. Dayamba, Charles Jahren, Jianhua “Jake” Yu (February 2015) works on Lightly Surfaced Roads: Stabilized Aggregate Applications according to this literature the local road officials in the US are oftentimes faced with the amenability of maintaining road networks with a finite financial budget. As a result, they are considering uncertainty process for upgrading aggregate-stratum roads and defaced paved roads. One process of upgrading these road types is to build a thick road base that consists of aggregate or recycled pavement and apply a light surface treatment (LST) as a surface course. The light surface provides a durable, impervious surfacing that maximize the skid resistance and minimize the amount of gravel loss and dust on a gravel road (Overby and Pinard 2013). Light surfaces add little to no structural strength to a road, but they enable the strength of the subbase or pavement to be preserved by preventing the ingress of water (Greening et al. 2001). As a result, it is particularly important to design the road structure to have sufficient strength to withstand the traffic loads.

This project included a survey at the county level to understand current practices for using LSTs to upgrade aggregate-surfaced roads in Minnesota, and the researchers performed a case study analysis of how MnDOT currently designs rural LVRs with light surfaces. Based on the results, the report discusses the limitations of various design methods and recommends applicable situations for each of the design methods. The survey was distributed to all 87 counties, and about half of the counties that responded to the survey had experience constructing LSTs. Chip seal and Otta seal were the most popular types of LSTs.

Pilot Project under Mukhya Mantri Gram Sampark Sadak Yojna (Chip Sealing Project) (Panchayat and Rural Development Department) District – Seoni, Betul, Shahdol and Katni (2012-2013) Pilot project for Demonstration of sealing of Gravel Road and Performance Evaluation for a period of two years including rainy season.



All villages having population less than 500 (250 in case of Tribal and IAP districts) are being provided all weather connectivity through construction of Gravel Roads under Chief Minister's Gram Sadak Yojana (CMGSY). It is planned complete this task by the year 2013. Under CMGSY, the gravel roads are being constructed as per provisions of "Manual for design, Construction and Maintenance of gravel roads," IRC: SP-77-2008 and "Ministry of Rural Development, Specification for gravel roads," published by IRC in August 2004.

The surface of road constructed under CMGSY is gravel; therefore, as an inherent limitation, dust nuisance is prominent in these roads. Accordingly, the public acceptability of gravel roads is also relatively low. It has emerged from the literature review that the practice of sealing gravel roads through chip sealing or surface dressing is practice in many countries, however, the use of 20 mm thick pre-mix-carpet is not very common.

As per available information, the sealing of gravel roads has not been taken-up in India on a large scale so far, however, in view of the provisions of Two Coat Surface dressing over Gravel Surface in Gravel Road manual IRC SP: 77-2008, it is proposed that the Gravel Roads constructed under CMGSY may be provided with the sealing through Two Coat Surface Dressing.

Conclusion: -

As from the above research it has been educe that To apply chip seal assurance, investigation is needed to evolve both execution -based circumstance and end product specifications. The quest that most of the non-Government responding department use some form of chip seal assurance makes this type of investigation both timely and important.

All types of chip seal are best applied in the warmest driest weather possible. The temperature of the surface should be a minimum of 21°C to 54°C when using emulsion, variable nozzles assent the application of minimise the rate of binder in the wheel paths and combat flooding in the wheel paths, a defect that makes chip seals prone to bleeding.

Reference: -

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